

# FIELD CROP PROTECTION GUIDE

2016–2017

*Publication 812*



**Discard old editions of this publication.** Each year the appropriate sub-committee of the Ontario Pest Management Research and Services Committee reviews the pesticides listed in this publication. To the best knowledge of the committee, at the time of printing, the pesticide products listed in this publication were:

- **federally registered**
- **classified by the Ministry of the Environment and Climate Change (MOECC)**

**The information in this publication is general information only.** The Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) does not offer any warranty or guarantee, nor does it assume any liability for any crop loss, animal loss, health, safety or environmental hazard caused by the use of a pesticide mentioned in this publication.

This publication lists a number of brand names of pesticides. It is neither an endorsement of the product nor a suggestion that similar products are ineffective.

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## The Pesticide Label

**Consult each product label before you use a pesticide.** The label provides specific information on how to use the product safely, hazards, restrictions on use, compatibility with other products, the effect of environmental conditions, etc.

**The pesticide product label is a legal document. Follow all label directions.**

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## Federal Registration of Pesticide Products

The Pest Management Regulatory Agency (PMRA) of Health Canada registers pesticide products for use in Canada based on following an evaluation of scientific data to ensure that the product has value, and the human health and environmental risks associated with its proposed use are acceptable.

### 1. Full Registration

Pesticide registrations are normally granted for a period of 5 years, subject to renewal.

### 2. Conditional Registration

Conditional registration may be granted for a specified, limited time period, where the registrant agrees to produce additional scientific or technical information.

### 3. Emergency Registration

An emergency registration is a temporary, time-limited registration of no more than 1 year, approved to deal with serious pest outbreaks that have limited control options.

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## Maximum Residue Limits

**The PMRA has established maximum residue limits (MRLs) for pesticides.** Processors or retailers may demand more restrictive limits. Growers should seek the advice of their intended market to determine if more restrictive limitations apply. Keep accurate and up-to-date records on pesticide use in each crop.

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## Supplemental Labels

You **MUST** obtain a supplemental label and follow all the label directions when PMRA approves new uses for a registered pesticide that do not appear on the current label.

Examples of when you must use a supplemental label include:

- **Emergency Use Registration**
- **Minor Use Label Expansion**

You can obtain a copy of a supplemental label from the pesticide manufacturer or pesticide vendor, the grower association that sponsored the emergency registration or minor use, from OMAFRA or from PMRA's Pest Management Information Service.

For more information on the federal registration status, check the PMRA website at [www.healthcanada.gc.ca/pmra](http://www.healthcanada.gc.ca/pmra) or call 1-800-267-6315.

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## Regulation of Pesticides in Ontario

The MOECC is responsible for regulating pesticide sale, use, transportation, storage and disposal in Ontario. Ontario regulates pesticides by placing appropriate education, licensing and/or permit requirements on their use, under the *Pesticides Act* and Regulation 63/09.

All pesticides must be used in accordance with requirements under the *Pesticides Act* and Regulation 63/09, which are available on the e-laws website at [ontario.ca/e-laws](http://ontario.ca/e-laws) or by calling ServiceOntario Publications toll-free number: 1-800-668-9938 or 416-326-5300.

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## Classification of Pesticides

The Ontario Pesticides Advisory Committee (OPAC) is responsible for reviewing and recommending to the MOECC, the classification of pesticide products before they can be sold or used in Ontario. Once approved by the MOECC, classified products are posted on the MOECC website: [ontario.ca/pesticides](http://ontario.ca/pesticides).

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## Certification and Licensing

### Certified Farmers and Their Assistants

For information about certification for growers and training for assistants, check the Ontario Pesticide Education Program website: [www.opec.ca](http://www.opec.ca) or call 1-800-652-8573.

### Commercial Applicators (Exterminators) and Their Assisting Technicians

For more information about exterminator licensing and technician training, visit:

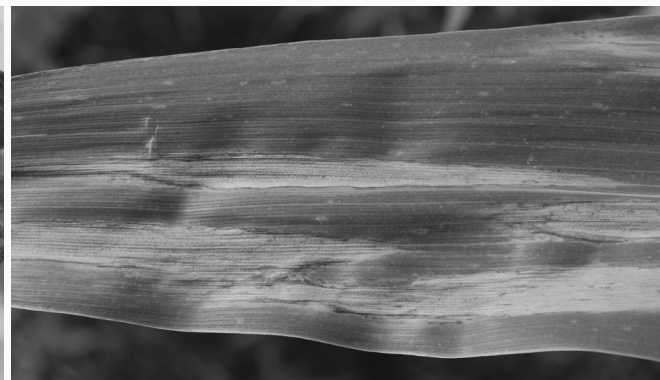
- The Ontario Pesticide Training and Certification website at [www.ontariopesticide.com](http://www.ontariopesticide.com) or call 1-888-620-9999 or 519-674-1575
- The Pesticide Industry Council's Pesticide Technician Program website at [www.horttrades.com/pesticide-technician](http://www.horttrades.com/pesticide-technician) or call 1-800-265-5656 or e-mail [pic@hort-trades.com](mailto:pic@hort-trades.com)
- The Pesticide Industry Regulatory Council (PIRC) at [www.oipma.ca](http://www.oipma.ca).

Cette publication est aussi disponible en français.

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## Acknowledgements

The information contained in this publication is supplied by Pest and Crop Specialists of the Agriculture Development Branch OMAFRA, University of Guelph, Ridgetown Campus, and Agriculture and Agri-Food Canada.

### Need technical or business information?

Contact the Agricultural Information Contact Centre at  
1-877-424-1300  
or [ag.info.omafra@ontario.ca](mailto:ag.info.omafra@ontario.ca)

### Looking for field crop production information on the Internet?

Check the OMAFRA website at  
[ontario.ca/crops](http://ontario.ca/crops)

You will find a comprehensive collection of Factsheets, articles and photos  
regarding the production and maintenance of field crops.

This publication contains pesticide products that have been registered as of December 5, 2015, for the control of major field crop pests of Ontario. For information related to production, harvest, storage and pest life cycles, identification and other management strategies, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*. Information on ordering OMAFRA publications is found on the inside back cover of this book. Supplements to this publication will be posted to the OMAFRA website.

## Cover Images

### FRONT COVER:

Top left: Fall armyworm on corn (Table 1–8, page 15)  
Top middle: Japanese beetle defoliation on soybean (Table 2–6, page 38)  
Top right: Northern corn leaf blight lesions on corn (Table 1–15, page 23)  
Bottom left: Frogeye leaf spot on soybean (Table 2–15, page 51)  
Bottom middle: Two-spotted spidermite–infested soybean field (Table 2–6, page 38)  
Bottom right: Swede midge injury on canola (Table 6–2, page 144)

### BACK COVER:

Top left: Western corn rootworm (Table 1–1, page 1)  
Top middle: Bunt-infected wheat kernels (Table 4–9, page 71)  
Top right: Bean leaf beetle feeding on a soybean pod (Table 2–3, page 33)  
Bottom left: White mould on dry beans (Table 5–12, page 139)  
Bottom middle: Seedcorn maggot damage in soybean field (Table 2–1, page 27)  
Bottom right: Stripe rust on wheat (Table 4–20, page 89)

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# Introduction

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## Products Listed in This Publication

Products listed in this book are registered for use on field crops and are organized by pest for each field crop. Consult each product label before using a pest control product. Labels for registered pest control products are available at the Pest Management Regulatory Agency (PMRA) website at <http://pr-rp.hc-sc.gc.ca/lr-re/index-eng.php>.

Within this publication, where rate ranges exist, consult the product label to determine what rate is most appropriate for your pest or disease situation.

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## Crop Group Information

A crop group is a grouping of plant species based on botany and taxonomy (e.g., plant families), as well as on how the crops are produced. Crop groups are often further divided into smaller and more closely related subgroups. A pest control product may be registered on a subgroup, rather than the entire crop group. Crop groupings are used primarily to set maximum residue limits and establish a common pre-harvest interval (PHI) for a similar set of crops. It is important to remember that not all products have a crop group registration, and products registered on one crop are not necessarily registered on all members of its crop group. There are some crops that do not belong in a crop group. A complete list of all crops included in both original and revised crop groups can be found on the Health Canada website: [www.hc-sc.gc.ca/cps-spc/pest/part/protect-proteger/food-nourriture/rccg-gcpcr-eng.php](http://www.hc-sc.gc.ca/cps-spc/pest/part/protect-proteger/food-nourriture/rccg-gcpcr-eng.php).

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## Levels of Control for Fungicides and Insecticides

The Efficacy Guidelines for Plant Protection Products in the *Pest Management Regulatory Agency Directive 2003–04* define levels of control as follows:

### Fungicides

**Control:** The product, when applied in accordance with the label directions, consistently reduces disease incidence and severity to a commercially acceptable level.

**Suppression:** Consistent control at a level that is not optimal but still of commercial benefit. Suppression is not used for products that show highly variable performance.

### Insecticides

**Control:** The product, when applied in accordance with the label directions, consistently reduces pest numbers or pest damage to a commercially acceptable level.

**Suppression:** The product, when applied in accordance with the label directions, does not consistently reduce pest numbers or pest damage to a commercially acceptable level. Under such situations, the level of performance offered by the product must still have value in a pest management program.

## Resistance Management Strategies

Different pesticides control pests or diseases in different ways. This is called the mode of action. Pesticides are grouped into chemical families and/or groups based on their mode of action. Using the same pesticide with the same mode of action season after season or several times within the same season could result in the target pest or disease becoming resistant to the chemical family. A pest or disease can develop resistance to one chemical family but still be very susceptible to another. Therefore, to reduce the risk of a pest or disease developing resistance, rotate between chemical groups and/or families within the same season or during successive growing seasons for control of the same pest or disease. For example, if using a Group 11 fungicide (e.g., Quadris) to control rust in corn, and more than one application is required that season to manage the disease, use a product from a different group (e.g., Tilt fungicide, which is a Group 3 fungicide) for the second application, because it controls the disease using a different mode of action. Pesticide labels indicate the chemistry group or family for the product. For a list of insecticide and fungicide chemical groups, see *Appendix F. Pesticide Groups Based on Sites of Action — Insecticides*, on page 191, and *Appendix G. Pesticide Groups Based on Sites of Action — Fungicides*, on page 192.

Only use chemical control when necessary and consider implementing an integrated pest management strategy, including cultural control (e.g., crop rotation, disease/pest resistant varieties, scouting, use of certified seed, etc.) or biological control, which will also help reduce the risk of a pest or disease developing resistance to a pesticide.

Do not exceed the total number of applications allowed per year for each product. Do not apply the product at rates lower than the recommended rate on the label.

Monitor recently treated pest or disease populations for signs of resistance.

See the pesticide label for more information on resistance management. As well, for more information on resistance management strategies or integrated pest management (IPM) options for a specific pest, see OMAFRA Publication 811, *Agronomy Guide for Field Crops*, or contact a certified crop advisor. IPM options are listed in the first column of the Chemical Control Options tables in this publication.

# 1. Corn (Field and Seed)

Bee kill incidences in Ontario have been found to be associated with the planting of corn and soybean seed treated with neonicotinoid. Growers are encouraged to follow best management practices to protect pollinators at planting. See Health Canada's pollinator protection web page: [www.healthcanada.gc.ca/pollinators](http://www.healthcanada.gc.ca/pollinators) and Chapter 10. Neonicotinoid Regulatory Requirements in Ontario, as well as [ontario.ca/neonics](http://ontario.ca/neonics) for the latest information.

## CORN INSECTS

**Table 1–1.** Chemical Control Options for Insects in Field and Seed Corn — Corn Rootworm

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Active Ingredient | Trade Name   | Rate                          | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|--------------|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CORN ROOTWORM (<i>Diabrotica virgifera</i> and <i>Diabrotica barberi</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                   |              |                               |                                                                                                                                                                                                                                                              |
| <b>Soil-Applied at Planting Only</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                   |              |                               |                                                                                                                                                                                                                                                              |
| <p>Avoid planting corn following corn. Crop rotation is the best strategy for control. Risk factors include heavier soil (clay), high beetle populations in corn of previous season and being the latest field planted in the previous season.</p> <p>If there is less than 1 beetle per corn plant on average throughout the month of August, then no insecticide is necessary in the following corn crop.</p> <p>In-furrow application is safer to the applicator and non-target mammals than T-band application.</p> <p>Granular insecticides are toxic to birds and small wild mammals. Any spilled or exposed granules must be incorporated into the soil or otherwise cleaned-up from the soil surface.</p> | tefluthrin        | Force 3.0G   | 37.5 g/<br>100-m (328-ft) row | May be applied in a T-band or in-furrow. For banded applications, place directly over the furrow in a 15-cm band ahead of the press wheel. For in-furrow applications, place all material directly in the open seed furrow, behind the planter disc openers. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | chlorpyrifos      | Lorsban 15 G | 75 g/<br>100-m (328-ft) row   | <b>Suppression only.</b> Must be applied in a 10–15-cm band over the row behind the planter shoe, in front of the press wheel. Do not place in direct contact with seed. 24-hr re-entry period.                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                   | Pyrifos 15 G | 75 g/<br>100-m (328-ft) row   |                                                                                                                                                                                                                                                              |

## CORN INSECTS

**Table 1–1.** Chemical Control Options for Insects in Field and Seed Corn — Corn Rootworm

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Active Ingredient           | Trade Name                                                                                                                                                                                                                              | Rate                                                                                                                                | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CORN ROOTWORM ( <i>Diabrotica virgifera</i> and <i>Diabrotica barberi</i> ) (cont'd)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                             |                                                                                                                                                                                                                                         |                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                      |
| Seed Treatment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                             |                                                                                                                                                                                                                                         |                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                      |
| In Ontario, the use of neonicotinoid seed treatments on corn and soybean seed is restricted. See Chapter 10 for further information on the requirements to use these products. Seed treatments are best suited for those fields at high risk of rootworm infestations, especially if planting corn after corn.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | clothianidin<br>(See NOTE.) | Poncho 1250                                                                                                                                                                                                                             | 166.7 mL/<br>80,000 kernels                                                                                                         | For use in commercial seed treatment facilities only. For low-to-moderate rootworm populations. Seed-applied insecticides can affect seed drop and final plant stands. Use approved lubricant as required to minimize dust and ensure planting accuracy. A 30-day plantback interval for cereal grains, grasses, soybeans and dry beans is required. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                             | NipsIt Inside 600                                                                                                                                                                                                                       |                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                      |
| <p><b>NOTE:</b> The planting of neonicotinoid-treated corn and soybean seed can pose a risk to pollinators. This includes all clothianidin, imidacloprid and thiamethoxam products. The contaminated insecticide dust emitted from pneumatic planters can drift onto flower and water sources and expose bees to these insecticides. Growers are encouraged to follow best management practices (BMPs) to protect pollinators at planting. To help minimize the dust generated during planting, refer to <i>Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices</i> on the Health Canada website at <a href="http://www.healthcanada.gc.ca/pollinators">www.healthcanada.gc.ca/pollinators</a>.</p> <p>If treated seeds are spilled outdoors or in areas accessible to birds, promptly clean up or bury to prevent ingestion.</p> | thiamethoxam<br>(See NOTE.) | Cruiser 5 FS                                                                                                                                                                                                                            | 166.7 mL/<br>80,000 kernels                                                                                                         | For use in commercial seed treatment facilities only. For low-to-moderate rootworm populations. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                          |
| Transgenic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                             |                                                                                                                                                                                                                                         |                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                      |
| There are cases of western corn rootworm developing resistance to Bt. To reduce the risk of resistance, growers are encouraged to control rootworm through crop rotation and plant-appropriate refuge when using Bt corn traits. For more information regarding Bt corn and/or refuge options, see the Canadian Corn Pest Coalition website at <a href="http://www.cornpest.ca">www.cornpest.ca</a> .                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Bt corn                     | Agrisure 3000GT<br>Agrisure 3122<br>Agrisure Vipera 3111<br>Genuity SmartStax<br>Genuity VT Triple Pro<br>Herculex XTRA<br>Optimum AcreMax Xtra<br>Optimum AcreMax XTreme<br>Optimum Intrasect Xtra<br>SmartStax<br>YieldGard VT Triple | See Table 9–7. <i>Bt Corn Products/ Traits Currently Available in Canada (as of April 2015)</i> , on page 176, for Bt corn options. | Use Bt hybrids in fields of continuous corn with moderate-to-high populations of rootworm. Keep careful and accurate records as to where Bt and non-Bt hybrids are planted or note if refuge in a bag was used.                                                                                                                                      |

## CORN INSECTS

Table 1–2. Chemical Control Options for Insects in Field and Seed Corn — Wireworms, Millipedes

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Active Ingredient           | Trade Name             | Rate                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| WIREWORMS ( <i>Limoni</i> spp. and others)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                             |                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                   |
| Seed Treatment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                             |                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                   |
| <p>In Ontario, the use of neonicotinoid seed treatments on corn and soybean seed is restricted. See Chapter 10 for further information on the requirements to use these products.</p> <p>The risk factors for wireworm infestations include fields with a history of cereal/corn/grassy weeds, sandy soils, history of wireworm problems and fields that are coming out of sod.</p> <p><b>NOTE:</b> The planting of neonicotinoid-treated corn and soybean seed can pose a risk to pollinators. This includes all clothianidin, imidacloprid and thiamethoxam products. The contaminated insecticide dust emitted from pneumatic planters can drift onto flower and water sources and expose bees to these insecticides. Growers are encouraged to follow best management practices (BMPs) to protect pollinators at planting. To help minimize the dust generated during planting, refer to <i>Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices</i> on the Health Canada website at <a href="http://www.healthcanada.gc.ca/pollinators">www.healthcanada.gc.ca/pollinators</a>.</p> <p>If treated seeds are spilled outdoors or in areas accessible to birds, promptly clean up or bury to prevent ingestion.</p> | clothianidin<br>(See NOTE.) | Poncho 250             | 33.3 mL/<br>80,000 kernels                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>For use in commercial seed treatment facilities only.</b> Seed-applied insecticides can affect seed drop and final plant stands. A 30-day plantback interval for cereal grains, grasses, soybeans and dry beans is required.                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | NipsIt Inside 600           |                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | imidacloprid<br>(See NOTE.) | Gaucho 480 FL          | 27 mL/<br>80,000 kernels                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>For use in commercial seed treatment facilities only.</b> Seed-applied insecticides can affect seed drop and final plant stands. Use approved lubricant as required to minimize dust and ensure planting accuracy.                                                                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                             | Sombrero 600 FS        | 21.3 mL/<br>80,000 kernels                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | thiamethoxam<br>(See NOTE.) | Cruiser 5 FS           | 16.7 mL/<br>80,000 kernels                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>For use in commercial seed treatment facilities only.</b> Seed-applied insecticides can affect seed drop and final plant stands. Use approved lubricant as required to minimize dust and ensure planting accuracy. Do not graze or feed livestock on treated areas for 45 days after planting. |
| cyantraniliprole                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Fortenza                    | 167 mL/<br>100 kg seed | <b>For use in commercial seed treatment facilities only.</b> Apply Fortenza as a water-based slurry utilizing standard slurry seed treatment equipment that provides uniform seed coverage. This product contains no colourant. An appropriate colourant must be added when this product is applied. Follow resistance management instructions as stated on label. Do not apply subsequent applications of a Group 28 insecticide (e.g., Coragen) following Fortenza seed treatment. |                                                                                                                                                                                                                                                                                                   |
| Soil Applied at Planting Only                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                             |                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                   |
| In-furrow application is safer to the applicator and non-target animals than T-band application. Granular insecticides are toxic to birds and small wild mammals. Any spilled or exposed granules must be incorporated into the soil or otherwise cleaned-up from the soil surface.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | tefluthrin                  | Force 3.0G             | 37.5 g/<br>100-m (328-ft) row                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>In-furrow application only.</b> Place directly in the seed furrow behind the planter disc openers.                                                                                                                                                                                             |
| MILLIPEDES (Various species)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                             |                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                   |
| <p>Millipedes can be a pest in cool, wet springs in fields with heavy residue or high organic matter. They can be misidentified as wireworms. Ensure that proper identification has been made.</p> <p>No registered products available at this time.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                             |                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                   |

## CORN INSECTS

**Table 1–3.** Chemical Control Options for Insects in Field and Seed Corn — Black Cutworm

| <b>LEGEND:</b> PHI = Pre-Harvest Interval (days)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                    | N/A = not applicable |                            |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|----------------------|----------------------------|------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Integrated Pest Management Options</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Active Ingredient</b>           | <b>Trade Name</b>    | <b>Rate</b>                | <b>PHI</b> | <b>Comments (label precautions, re-entry periods, etc.)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>BLACK CUTWORM (<i>Agrotis ipsilon</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                    |                      |                            |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                    |                      |                            |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <p>In Ontario, the use of neonicotinoid seed treatments on corn and soybean seed is restricted. See Chapter 10 for further information on the requirements to use these products.</p> <p>Clothianidin may not be used as a corn seed treatment solely for protection from black cutworm.</p> <p>However, seed treatments used for the control of other soil insect pests may provide early-season protection from young black cutworm larvae.</p> <p>Black cutworm is a sporadic pest. Using seed treatments specifically for black cutworm control is not needed unless the field has had a continuous history of cutworm injury.</p> <p><b>NOTE:</b> The planting of neonicotinoid-treated corn and soybean seed can pose a risk to pollinators. This includes all clothianidin, imidacloprid and thiamethoxam products. The contaminated insecticide dust emitted from pneumatic planters can drift onto flower and water sources and expose bees to these insecticides. Growers are encouraged to follow best management practices (BMPs) to protect pollinators at planting. To help minimize the dust generated during planting, refer to <i>Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices</i> on the Health Canada website at <a href="http://www.healthcanada.gc.ca/pollinators">www.healthcanada.gc.ca/pollinators</a>.</p> <p>If treated seeds are spilled outdoors or in areas accessible to birds, promptly clean up or bury to prevent ingestion.</p> | clothianidin<br><b>(See NOTE.)</b> | Poncho 250           | 33.3 mL/<br>80,000 kernels | N/A        | <p><b>For seed corn only.</b> The use of neonicotinoid seed treatments for black cutworm control is not permitted on field corn. <b>For use in commercial seed treatment facilities only.</b> Seed-applied insecticides can affect seed drop and final plant stands. Use approved lubricant as required to minimize dust and ensure planting accuracy. A 30-day plant-back interval for cereal grains, grasses, soybeans and dry beans is required.</p>                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                    | NipsIt Inside 600    |                            |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | cyantraniliprole                   | Fortenza             | 167 mL/<br>100 kg seed     | N/A        | <p><b>For use in commercial seed treatment facilities only.</b> Apply Fortenza as a water-based slurry utilizing standard slurry seed treatment equipment that provides uniform seed coverage. This product contains no colourant. An appropriate colourant must be added when this product is applied. Follow resistance management instructions as stated on label. Do not apply subsequent applications of a Group 28 insecticide (e.g., Coragen) following Fortenza seed treatment.</p> |

## CORN INSECTS

**Table 1–3.** Chemical Control Options for Insects in Field and Seed Corn — Black Cutworm

| <b>LEGEND:</b> PHI = Pre-Harvest Interval (days)      N/A = not applicable                                                                                                                                                                                                                                                                                                                                                                                                        |                          |                                                                                                                                                                                                                                                                                  |                                                                                                                                                           |            |                                                                                                                                                                                                                                                                                                                               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Integrated Pest Management Options</b>                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Active Ingredient</b> | <b>Trade Name</b>                                                                                                                                                                                                                                                                | <b>Rate</b>                                                                                                                                               | <b>PHI</b> | <b>Comments (label precautions, re-entry periods, etc.)</b>                                                                                                                                                                                                                                                                   |
| <b>BLACK CUTWORM (<i>Agrotis ipsilon</i>) (cont'd)</b>                                                                                                                                                                                                                                                                                                                                                                                                                            |                          |                                                                                                                                                                                                                                                                                  |                                                                                                                                                           |            |                                                                                                                                                                                                                                                                                                                               |
| <b>Soil-Applied at Planting Only</b>                                                                                                                                                                                                                                                                                                                                                                                                                                              |                          |                                                                                                                                                                                                                                                                                  |                                                                                                                                                           |            |                                                                                                                                                                                                                                                                                                                               |
| Risk factors for black cutworm infestations include fields with winter annual weeds and volunteer wheat before planting, no-till fields or heavy soybean residue. Control annual weeds at least 3 weeks prior to planting to reduce attraction by adult moths flying in from the south.<br><br>Granular insecticides are toxic to birds and small wild mammals. Any spilled or exposed granules must be incorporated into the soil or otherwise cleaned up from the soil surface. | tefluthrin               | Force 3.0G                                                                                                                                                                                                                                                                       | 37.5 g/<br>100-m (328-ft) row                                                                                                                             | N/A        | Soil-applied control is not as good as a well-timed rescue treatment. May be applied as a banded or in-furrow application. For banded applications, place directly in a 15-cm band ahead of the press wheel. For in-furrow application, place all material directly in the open seed furrow, behind the planter disc openers. |
| <b>Transgenic Corn</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                          |                                                                                                                                                                                                                                                                                  |                                                                                                                                                           |            |                                                                                                                                                                                                                                                                                                                               |
| Use transgenic corn specifically for black cutworm control only in those fields with a history of cutworm infestations, as this pest is sporadic and may only require foliar control when thresholds are reached.                                                                                                                                                                                                                                                                 | Bt corn                  | Agrisure 3122<br>Agrisure Vipitera 3110<br>Agrisure Vipitera 3111<br>Agrisure Vipitera 3220<br>Genuity SmartStax<br>Herculex I<br>Herculex XTRA<br>Optimum AcreMax<br>Optimum AcreMax Xtra<br>Optimum AcreMax XTreme<br>Optimum Intrasect<br>Optimum Intrasect Xtra<br>SmartStax | See Table 9–7.<br><i>Bt Corn Products/<br/>Traits Currently<br/>Available in Canada<br/>(as of April 2015), on<br/>page 176, for Bt corn<br/>options.</i> | N/A        | <b>Use Bt hybrids containing Cry1F or Vip3A only.</b> May only control young larvae.<br><br>Keep careful and accurate records as to where Bt and non-Bt hybrids are planted or note if refuge in a bag is used.                                                                                                               |

## CORN INSECTS

**Table 1–3.** Chemical Control Options for Insects in Field and Seed Corn — Black Cutworm

| <b>LEGEND:</b> PHI = Pre-Harvest Interval (days)      N/A = not applicable                                                                                                                                                                                                                                                                        |                          |                   |                                   |                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-------------------|-----------------------------------|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Integrated Pest Management Options</b>                                                                                                                                                                                                                                                                                                         | <b>Active Ingredient</b> | <b>Trade Name</b> | <b>Rate</b>                       | <b>PHI</b>                                | <b>Comments (label precautions, re-entry periods, etc.)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>BLACK CUTWORM (<i>Agrotis ipsilon</i>) (cont'd)</b>                                                                                                                                                                                                                                                                                            |                          |                   |                                   |                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Rescue Treatments</b>                                                                                                                                                                                                                                                                                                                          |                          |                   |                                   |                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Scout early. Black cutworms are easier to control when larvae are small. Look for leaf-feeding (pinholes) by young climbing larvae as the first sign of damage. If more than 10% of plants show leaf feeding, or 3% of the plants are cut at the base and larvae are smaller than 2.5 cm, treating at this time will provide nearly 100% control. | permethrin               | Ambush 500 EC     | 140 mL/ha<br>(60 mL/acre)         | 1                                         | <b>Apply at seedling stage only.</b> Apply under warm, moist conditions in evening or night when cutworms are most active. Do not disturb the soil for 5 days after application.<br><br>Toxic to bees. Avoid spraying when bees are foraging. Spray deposit should be dry before bees commence foraging in treated crop.                                                                                                                                                                                                          |
|                                                                                                                                                                                                                                                                                                                                                   |                          | Pounce 384 EC     | 180 mL/ha<br>(73 mL/acre)         | 1                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                   | cypermethrin             | Mako              | 175 mL/ha<br>(70 mL/acre)         | 21                                        | <b>Apply at seedling stage only.</b> Apply under warm, moist conditions in evening or night when cutworms are most active. Do not disturb soil for 5 days after application.<br><br>Toxic to bees and other beneficial insects. Avoid spraying when bees are foraging.                                                                                                                                                                                                                                                            |
|                                                                                                                                                                                                                                                                                                                                                   | chlorpyrifos             | Lorsban 4E        | 1.2–2.4 L/ha<br>(480–960 mL/acre) | 70                                        | <b>Apply at seedling stage only.</b> For best results, apply in the evening. Maximum 1 application/yr. 24-hr re-entry period.<br><br>Toxic to bees exposed to direct treatment, drift or residues on blooming plants. <b>DO NOT</b> use on flowering crops or weeds. <b>DO NOT</b> apply this product or allow it to drift to flowering crops or weeds if bees are visiting the treatment area. Applicators should inform local beekeepers prior to application if hives are in adjacent fields.                                  |
|                                                                                                                                                                                                                                                                                                                                                   |                          | Pyrinex 480 EC    | 1.2–2.4 L/ha<br>(480–960 mL/acre) | 70                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                   | lambda-cyhalothrin       | Matador 120 EC    | 83 mL/ha<br>(34 mL/acre)          | silage:<br>14<br>field and<br>seed:<br>21 | <b>Apply at seedling stage only.</b> Apply under warm, moist conditions in evening or night when cutworms are most active. Do not disturb soil for 5 days after application. 24-hr re-entry period.<br><br>This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. |
|                                                                                                                                                                                                                                                                                                                                                   |                          | Silencer 120 EC   |                                   |                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                   | chlorantraniliprole      | Coragen           | 250 mL/ha<br>(101 mL/acre)        | field corn:<br>14<br>seed corn:<br>1      | Apply to foliage when rain is not expected in the next 24 hr. Use a minimum of 100 L/ha of water. Maximum 4 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                               |

## CORN INSECTS

**Table 1–4.** Chemical Control Options for Insects in Field and Seed Corn — Seedcorn Maggot, Seedcorn Beetle

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Active Ingredient           | Trade Name        | Rate                            | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-------------------|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SEEDCORN MAGGOT ( <i>Delia platura</i> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                             |                   |                                 |                                                                                                                                                                                                                                                                                                            |
| Seed Treatment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                             |                   |                                 |                                                                                                                                                                                                                                                                                                            |
| For all seed treatments, use full rate and ensure good coverage of seed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                             |                   |                                 |                                                                                                                                                                                                                                                                                                            |
| In Ontario, the use of neonicotinoid seed treatments on corn and soybean seed is restricted. See Chapter 10 for further information on the requirements to use these products.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | clothianidin<br>(See NOTE.) | Poncho 250        | 33.3 mL/<br>80,000 kernels      | For use in commercial seed treatment facilities only. Seed-applied insecticides can affect seed drop and final plant stands. Use approved lubricant as required to minimize dust and ensure planting accuracy. A 30-day plantback interval for cereal grains, grasses, soybeans and dry beans is required. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                             | NipsIt Inside 600 |                                 |                                                                                                                                                                                                                                                                                                            |
| Seedcorn maggot problems in corn are rare in Ontario. Use seed treatments in high-risk fields where large amounts of manure, green manure or residue have been recently incorporated, in fields that are freshly tilled or when cool, unfavourable emergence conditions exist.                                                                                                                                                                                                                                                                                                                                                                                                                                           | thiamethoxam<br>(See NOTE.) | Cruiser 5 FS      | 16.7–33.3 mL/<br>80,000 kernels | For use in commercial seed treatment facilities only. Seed-applied insecticides can affect seed drop and final plant stands. Use approved lubricant as required to minimize dust and ensure planting accuracy. Do not graze or feed livestock on treated areas for 45 days after planting.                 |
| NOTE: The planting of neonicotinoid-treated corn and soybean seed can pose a risk to pollinators. This includes all clothianidin, imidacloprid and thiamethoxam products. The contaminated insecticide dust emitted from pneumatic planters can drift onto flower and water sources and expose bees to these insecticides. Growers are encouraged to follow best management practices (BMPs) to protect pollinators at planting. To help minimize the dust generated during planting, refer to <i>Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices</i> on the Health Canada website at <a href="http://www.healthcanada.gc.ca/pollinators">www.healthcanada.gc.ca/pollinators</a> . |                             |                   |                                 |                                                                                                                                                                                                                                                                                                            |
| Soil-Applied at Planting Only                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                             |                   |                                 |                                                                                                                                                                                                                                                                                                            |
| In-furrow application is safer to the applicator and non-target animals than T-band application.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | tefluthrin                  | Force 3.0G        | 37.5 g/<br>100-m (328-ft) row   | In-furrow application only. Place directly in the seed furrow behind the planter disc openers.                                                                                                                                                                                                             |
| SEEDCORN BEETLE ( <i>Agonoderus lecontei</i> and <i>Clivina impressifrons</i> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                             |                   |                                 |                                                                                                                                                                                                                                                                                                            |
| Risk factors for seedcorn beetle infestations include no-till, cool, wet spring and slow crop emergence conditions.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                             |                   |                                 |                                                                                                                                                                                                                                                                                                            |
| No registered products available at this time.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                             |                   |                                 |                                                                                                                                                                                                                                                                                                            |

## CORN INSECTS

**Table 1–5.** Chemical Control Options for Insects in Field and Seed Corn — European Chafer, Corn Flea Beetle

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Active Ingredient                  | Trade Name        | Rate                       | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-------------------|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>GRUB — EUROPEAN CHAFER (<i>Rhizotrogus majalis</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                    |                   |                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                    |                   |                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <p>In Ontario, the use of neonicotinoid seed treatments on corn and soybean seed is restricted. See Chapter 10 for further information on the requirements to use these products. Avoid planting corn if the grub population is extreme — plant soybeans instead.</p> <p>See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i>, for further information on insect biology and management options.</p> <p><b>NOTE:</b> The planting of neonicotinoid-treated corn and soybean seed can pose a risk to pollinators. This includes all clothianidin, imidacloprid and thiamethoxam products. The contaminated insecticide dust emitted from pneumatic planters can drift onto flower and water sources and expose bees to these insecticides. Growers are encouraged to follow best management practices (BMPs) to protect pollinators at planting. To help minimize the dust generated during planting, refer to <i>Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices</i> on the Health Canada website at <a href="http://www.healthcanada.gc.ca/pollinators">www.healthcanada.gc.ca/pollinators</a>.</p> <p>If treated seeds are spilled outdoors or in areas accessible to birds, promptly clean up or bury to prevent ingestion.</p> | clothianidin<br><b>(See NOTE.)</b> | Poncho 250        | 33.3 mL/<br>80,000 kernels | <b>For use in commercial seed treatment facilities only.</b> Seed-applied insecticides can affect seed drop and final plant stands. Use approved lubricant as required to minimize dust and ensure planting accuracy. A 30-day plantback interval for cereal grains, grasses, soybeans and dry beans is required.                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                    | NipsIt Inside 600 |                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | thiamethoxam<br><b>(See NOTE.)</b> | Cruiser 5 FS      | 16.7 mL/<br>80,000 kernels | <b>For use in commercial seed treatment facilities only.</b> Seed-applied insecticides can affect seed drop and final plant stands. Use approved lubricant as required to minimize dust and ensure planting accuracy. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | cyantraniliprole                   | Fortenza          | 167 mL/<br>100 kg seed     | <b>For use in commercial seed treatment facilities only.</b> Apply Fortenza as a water-based slurry utilizing standard slurry seed treatment equipment that provides uniform seed coverage. This product contains no colourant. An appropriate colourant must be added when this product is applied. Follow resistance management instructions as stated on label. Do not apply subsequent applications of a Group 28 insecticide (e.g., Coragen) following Fortenza seed treatment. |

## CORN INSECTS

**Table 1–5.** Chemical Control Options for Insects in Field and Seed Corn — European Chafer, Corn Flea Beetle

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Active Ingredient           | Trade Name        | Rate                            | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-------------------|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CORN FLEA BEETLE (<i>Chaetocnema pulicaria</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                             |                   |                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                             |                   |                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <p>In Ontario, the use of neonicotinoid seed treatments on corn and soybean seed is restricted. See Chapter 10 for further information on the requirements to use these products.</p> <p>Flea beetles are a vector of Stewart's bacterial wilt. It is uneconomical to spray corn with insecticides to protect against Stewart's wilt except in seed corn with highly susceptible inbreds.</p> <p><b>NOTE:</b> The planting of neonicotinoid-treated corn and soybean seed can pose a risk to pollinators. This includes all clothianidin, imidacloprid and thiamethoxam products. The contaminated insecticide dust emitted from pneumatic planters can drift onto flower and water sources and expose bees to these insecticides. Growers are encouraged to follow best management practices (BMPs) to protect pollinators at planting. To help minimize the dust generated during planting, refer to <i>Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices</i> on the Health Canada website at <a href="http://www.healthcanada.gc.ca/pollinators">www.healthcanada.gc.ca/pollinators</a>.</p> <p>If treated seeds are spilled outdoors or in areas accessible to birds, promptly clean up or bury to prevent ingestion.</p> | clothianidin<br>(See NOTE.) | Poncho 250        | 33.3 mL/<br>80,000 kernels      | <b>For seed corn only.</b> The use of neonicotinoid seed treatments solely for protection against flea beetles is not permitted on field corn. <b>For use in commercial seed treatment facilities only.</b> Seed-applied insecticides can affect seed drop and final plant stands. Use approved lubricant as required to minimize dust and ensure planting accuracy. A 30-day plantback interval for cereal grains, grasses, soybeans and dry beans is required. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                             | NipsIt Inside 600 |                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | imidacloprid<br>(See NOTE.) | Gaucho 480 FL     | 100 mL/<br>80,000 kernels       | <b>For seed corn only.</b> The use of neonicotinoid seed treatments solely for protection against flea beetles is not permitted on field corn. <b>For use in commercial seed treatment facilities only.</b> Ensure good coverage. Seed-applied insecticides can affect seed drop and final plant stands. Use approved lubricant as required to minimize dust and ensure planting accuracy.                                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                             | Sombrero 600 FS   | 21.3 mL/<br>80,000 kernels      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | thiamethoxam<br>(See NOTE.) | Cruiser 5 FS      | 16.7–33.3 mL/<br>80,000 kernels | <b>For seed corn only.</b> The use of neonicotinoid seed treatments solely for protection against flea beetles is not permitted on field corn. <b>For use in commercial seed treatment facilities only.</b> Seed-applied insecticides can affect seed drop and final plant stands. Use approved lubricant as required to minimize dust and ensure planting accuracy. Do not graze or feed livestock on treated areas for 45 days after planting.                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                             |                   |                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

## CORN INSECTS

**Table 1–6.** Chemical Control Options for Insects in Field and Seed Corn — European Corn Borer

| <b>LEGEND:</b> PHI = Pre-Harvest Interval (days)      N/A = not applicable                                                                                                                                                                                                                                                                                                             |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                           |            |                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Integrated Pest Management Options</b>                                                                                                                                                                                                                                                                                                                                              | <b>Active Ingredient</b> | <b>Trade Name</b>                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Rate</b>                                                                                                                                               | <b>PHI</b> | <b>Comments (label precautions, re-entry periods, etc.)</b>                                                                                                                                                                                                                                                                                                  |
| <b>EUROPEAN CORN BORER (ECB) (<i>Ostrinia nubilalis</i>)</b>                                                                                                                                                                                                                                                                                                                           |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                           |            |                                                                                                                                                                                                                                                                                                                                                              |
| <b>Transgenic Corn</b>                                                                                                                                                                                                                                                                                                                                                                 |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                           |            |                                                                                                                                                                                                                                                                                                                                                              |
| To manage potential corn borer resistance, plant the appropriate refuge for the Bt corn trait used and follow all insect resistance management strategies mandated by the Canadian Food Inspection Agency. For more information regarding Bt corn and/or refuge options, see the Canadian Corn Pest Coalition website, found at <a href="http://www.cornpest.ca">www.cornpest.ca</a> . | Bt corn                  | Agrisure 3000GT<br>Agrisure 3122<br>Agrisure CB/LL<br>Agrisure GT/CB/LL<br>Agrisure Viptera 3110<br>Agrisure Viptera 3111<br>Agrisure Viptera 3220<br>Genuity SmartStax<br>Genuity VT Double Pro<br>Genuity VT Triple Pro<br>Herculex I<br>Herculex XTRA<br>Optimum AcreMax<br>Optimum AcreMax Xtra<br>Optimum AcreMax XTreme<br>Optimum Intrasect<br>Optimum Intrasect Xtra<br>SmartStax<br>YieldGard CB<br>YieldGard VT Triple | See Table 9–7.<br><i>Bt Corn Products/<br/>Traits Currently<br/>Available in Canada<br/>(as of April 2015),<br/>on page 176, for Bt<br/>corn options.</i> | N/A        | Insecticides have generally not provided economic control of ECB in field corn. Bt corn provides much better control. Use corn hybrids that express the Bt toxin in the ear as well as the stalk to help avoid stalk and ear rot.<br><br>Keep careful and accurate records as to where Bt and non-Bt hybrids are planted or note if refuge in a bag is used. |

## CORN INSECTS

Table 1–6. Chemical Control Options for Insects in Field and Seed Corn — European Corn Borer

| LEGEND: PHI = Pre-Harvest Interval (days)                                                             |                     | N/A = not applicable                 |                                                                  |                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |
|-------------------------------------------------------------------------------------------------------|---------------------|--------------------------------------|------------------------------------------------------------------|--------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Integrated Pest Management Options                                                                    | Active Ingredient   | Trade Name                           | Rate                                                             | PHI                                        | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |
| EUROPEAN CORN BORER (ECB) ( <i>Ostrinia nubilalis</i> ) (cont'd)                                      |                     |                                      |                                                                  |                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |
| Foliar Treatment                                                                                      |                     |                                      |                                                                  |                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |
| See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , to calculate economic thresholds. | deltamethrin        | Decis 5 EC                           | 250–300 mL/ha<br>(100–120 mL/acre)                               | 1                                          | <b>Ground application only.</b> Apply when egg masses begin to hatch but no later than when 1st pinhole feeding occurs on foliage. For 2nd brood in late planting, apply before tassels show. Repeat in 5–8-day intervals. Use at least 240 L water/ha. Maximum 3 applications/yr. Do not feed silage or stubble to dairy cattle. 12-hr re-entry period.<br><br>Toxic to bees for 1 day after application. <b>DO NOT</b> apply when crop or weeds are in bloom.                                                                                                                                                                                                                                                                        |  |
|                                                                                                       | cypermethrin        | Mako                                 | 175 mL/ha<br>(70 mL/acre)                                        | 5                                          | Ground and aerial application. Apply when egg masses begin to hatch but no later than when 1st feeding occurs on foliage. For 2nd brood in late planting, apply before tassels show. Use a minimum 300–500 L water/ha for ground application and 11–22 L/ha for aerial application. Maximum 3 applications/yr. Do not apply more than 2 applications by air. Re-entry period when foliage dries.<br><br>Toxic to bees and other beneficial insects. Avoid spraying when bees are foraging.                                                                                                                                                                                                                                             |  |
|                                                                                                       | chlorantraniliprole | Coragen                              | 250–375 mL/ha<br>(101–151 mL/acre)                               | field corn:<br>14<br>seed corn:<br>1       | Ground and aerial application. Apply to foliage when rain is not expected in the next 24 hr. Time application to coincide with peak egg hatch. Use a minimum of 100 L/ha of water. Maximum 4 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |
|                                                                                                       | lambda-cyhalothrin  | Matador 120 E<br><br>Silencer 120 EC | 187 mL/ha<br>(76 mL/acre)<br><br>83–187 mL/ha<br>(34–76 mL/acre) | silage:<br>14<br><br>field and seed:<br>21 | Ground and aerial application. For best results, apply in the early morning, before temperatures rise, or during the evening, past the heat of the day. Use 100–200 L water/ha for ground application, 10–40 L water/ha for aerial application. Spray no later than 10 days after egg hatch. Maximum 3 applications/yr. Do not apply more than 2 applications of 83 mL/ha by air. 24-hr re-entry period.<br><br>This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. |  |

## CORN INSECTS

**Table 1–6.** Chemical Control Options for Insects in Field and Seed Corn — European Corn Borer

| <b>LEGEND:</b> PHI = Pre-Harvest Interval (days)      N/A = not applicable                            |                                          |                   |                                        |                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------------------------------------------------------------------------------------|------------------------------------------|-------------------|----------------------------------------|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Integrated Pest Management Options</b>                                                             | <b>Active Ingredient</b>                 | <b>Trade Name</b> | <b>Rate</b>                            | <b>PHI</b>                                | <b>Comments (label precautions, re-entry periods, etc.)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>EUROPEAN CORN BORER (ECB) (<i>Ostrinia nubilalis</i>) (cont'd)</b>                                 |                                          |                   |                                        |                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Foliar Treatment (cont'd)</b>                                                                      |                                          |                   |                                        |                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , to calculate economic thresholds. | <i>Bacillus thuringiensis</i>            | Bioprotec CAF     | 2.8–4.0 L/ha<br>(1.1–1.6 L/acre)       | 1                                         | <b>Ground application only.</b> This product is a good option for organically grown corn. Apply at first signs of infestation when larvae are small. Repeat applications, according to economic threshold, as necessary to maintain control. Use a minimum of 300 L/ha of water. This product is more effective when no rain occurs within 24–48 hr after application. Maximum 6 applications/yr.                                                                                                                                                                                                                                                                                                                                                                                 |
|                                                                                                       |                                          | Dipel 2X DF       | 0.56–1.12 kg/ha<br>(0.22–0.45 kg/acre) | 1                                         | This product is a good option for organically grown corn. Apply when pinhole feeding is observed in at least 5% of the plants. Repeat at 7-day intervals. Only effective against small larvae and must be applied before larvae begin stalk boring.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                                                                       | carbaryl                                 | Sevin XLR Plus    | 2.5–4.0 L/ha<br>(1.0–1.6 L/acre)       | 1                                         | For larvae in whorls and foliage, treat entire plant. Repeat as necessary. For silks and ears, apply in 2–4-day intervals when silks first appear.<br><br>This product is highly toxic to honeybees exposed to direct treatment on blooming crops or weeds. Apply Sevin XLR Plus from late evening to early morning or when bees are not foraging.                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                       | lambda-cyhalothrin + chlorantraniliprole | Voliam Xpress     | 500 mL/ha<br>(200 mL/acre)             | silage:<br>14<br>field and<br>seed:<br>21 | Apply no later than when the first feeding is seen on foliage. Re-apply after 7 days, depending on the presence of significant populations as determined by local monitoring. This treatment will not prevent internal cob damage if the insect has penetrated the ear. Allow a 7-day interval between treatments. For ground application, apply in a minimum of 150 L of water/ha. For aerial application, apply in a minimum of 40 L of water/ha.<br><br>This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. |
|                                                                                                       | methoxyfenozide                          | Intrepid          | 300–600 mL/ha<br>(120–240 mL/acre)     | 21                                        | Apply at the first signs of feeding damage before the insect enters the ear. Monitoring of insect populations is key to controlling this pest. Direct application at the whorl for early-season (first-generation) infestations. Repeat applications after 5–10 days if required, based on population monitoring. Use the higher rate for heavy infestations or larger crop canopies.                                                                                                                                                                                                                                                                                                                                                                                             |

## CORN INSECTS

**Table 1–7.** Chemical Control Options for Insects in Field and Seed Corn — Western Bean Cutworm

| <b>LEGEND:</b> PHI = Pre-Harvest Interval (days) — = no information was provided on the product label N/A = not applicable                                                                                                                                                                                                            |                          |                                                                                                                                                                                                                                                                               |                                                                                                                                     |            |                                                                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Integrated Pest Management Options</b>                                                                                                                                                                                                                                                                                             | <b>Active Ingredient</b> | <b>Trade Name</b>                                                                                                                                                                                                                                                             | <b>Rate</b>                                                                                                                         | <b>PHI</b> | <b>Comments (label precautions, re-entry periods, etc.)</b>                                                                                                                                                                                                                                                                                                                                                                |
| <b>WESTERN BEAN CUTWORM (<i>Striacosta albicosta</i>)</b>                                                                                                                                                                                                                                                                             |                          |                                                                                                                                                                                                                                                                               |                                                                                                                                     |            |                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Transgenic Corn</b>                                                                                                                                                                                                                                                                                                                |                          |                                                                                                                                                                                                                                                                               |                                                                                                                                     |            |                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Plant the appropriate refuge for the Bt corn trait used and follow all insect resistance management strategies mandated by the Canadian Food Inspection Agency. For more information regarding Bt corn and/or refuge options, see the Canadian Corn Pest Coalition website, at <a href="http://www.cornpest.ca">www.cornpest.ca</a> . | Bt corn                  | Agrisure 3122<br>Agrisure Viptera 3110<br>Agrisure Viptera 3111<br>Agrisure Viptera 3220<br>Genuity SmartStax<br>Herculex I<br>Herculex XTRA<br>Optimum AcreMax<br>Optimum AcreMax Xtra<br>Optimum AcreMax XTreme<br>Optimum Intrasect<br>Optimum Intrasect Xtra<br>SmartStax | See Table 9–7. <i>Bt Corn Products/ Traits Currently Available in Canada (as of April 2015)</i> , on page 176, for Bt corn options. | N/A        | Bt corn hybrids containing Vip3A provide full control. Bt corn hybrids containing Cry1F provide some control. Some ear feeding may still occur on Cry1F hybrids and could result in ear rot (mycotoxin) development. YieldGard Bt corn varieties (Cry 1Ab) do not control western bean cutworm.<br><br>Keep careful and accurate records as to where Bt and non-Bt hybrids are planted or note if refuge in a bag is used. |

## CORN INSECTS

**Table 1–7.** Chemical Control Options for Insects in Field and Seed Corn — Western Bean Cutworm

| <b>LEGEND:</b> PHI = Pre-Harvest Interval (days) — = no information was provided on the product label N/A = not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                             |                   |                                    |                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|-------------------|------------------------------------|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Integrated Pest Management Options</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Active Ingredient</b>                    | <b>Trade Name</b> | <b>Rate</b>                        | <b>PHI</b>                                | <b>Comments (label precautions, re-entry periods, etc.)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>WESTERN BEAN CUTWORM (<i>Striacosta albicosta</i>) (cont'd)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                             |                   |                                    |                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Foliar Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                             |                   |                                    |                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <p>Use pheromone traps to monitor for pest presence and peak flight. Focus scouting efforts on the top three-to-four leaves of the plant. Look for egg masses and young larvae. Eggs hatch 1 or 2 days after turning purple. Spray is warranted if 5% of the plants have eggs or small larvae. Spray is only effective on small larvae, prior to them entering the ear. Additional impact on quality can be expected from ear rots and secondary pests that may enter and feed on the damaged ears.</p> <p>Additional information on pest status and management recommendations is provided at the Ontario WBC Trap Network: <a href="http://www.cornpest.ca">www.cornpest.ca</a>.</p> | lambda-cyhalothrin                          | Matador 120 E     | 83–187 mL/ha<br>(34–76 mL/acre)    | silage:<br>14<br>field and<br>seed:<br>21 | <p>Ground and aerial application. For best results, apply in the early morning, before temperatures rise, or during the evening. Use 100–200 L water/ha for ground application, 10–40 L water/ha for aerial application. Spray no later than 10 days after egg hatch. Maximum 3 applications/yr. Do not apply more than 2 applications of 83 mL/ha by air. 24-hr re-entry period.</p> <p>This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.</p>                                                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | deltamethrin                                | Decis 5.0 EC      | 250–300 mL/ha<br>(100–120 mL/acre) | 1                                         | <p><b>Ground application only.</b> Apply when egg masses begin to hatch. Use at least 240 L water/ha. Maximum 3 applications/yr. Do not feed silage or stubble to dairy cattle. 12-hr re-entry period.</p> <p>Toxic to bees for 1 day after application. <b>DO NOT</b> apply when crop or weeds are in bloom.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | lambda-cyhalothrin<br>+ chlorantraniliprole | Voliam Xpress     | 500 mL/ha<br>(200 mL/acre)         | silage:<br>14<br>field and<br>seed:<br>21 | <p>Apply no later than when the first feeding is seen. Re-apply after 7 days, depending on the presence of significant populations as determined by local monitoring. This treatment will not prevent internal cob damage if the insect has penetrated the ear. Allow a 7-day interval between treatments. For ground application — apply in a minimum of 150 L of water/ha. For aerial application — apply in a minimum of 40 L of water/ha.</p> <p>This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.</p> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | chlorantraniliprole                         | Coragen           | 250–375 mL/ha<br>(101–151 mL/acre) | seed corn:<br>1<br>field corn:<br>14      | <p>For ground application, use a minimum water volume of 100 L/ha and 50 L/ha for aerial. Thorough coverage is required to obtain optimum control. Use high rate of Coragen under heavy pest pressure. Minimum of 3 days between applications. Maximum 4 applications/yr. 12-hr re-entry period. Do not exceed a total of 1.125 L of Coragen/ha/season.</p>                                                                                                                                                                                                                                                                                                                                                                                                                     |

## CORN INSECTS

**Table 1–8.** Chemical Control Options for Insects in Field and Seed Corn — Armyworm, Corn Leaf Aphid, Brown Marmorated Stink Bug, Potato Stem Borer, Slugs, Sap Beetles**LEGEND:** PHI = Pre-Harvest Interval (days)

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Active Ingredient   | Trade Name               | Rate                               | PHI                              | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|--------------------------|------------------------------------|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ARMYWORM (TRUE – <i>Pseudaletia unipuncta</i> , FALL – <i>Spodoptera frugiperda</i> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                     |                          |                                    |                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Foliar Treatment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                     |                          |                                    |                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Late-planted corn is most susceptible to leaf and whorl feeding by armyworm.<br><br><b>True armyworm:</b> Insecticide may be warranted in seedling corn if there are two or more unparasitized larvae per seedling, and feeding damage exceeds 10%. In corn past the 6-leaf stage, if 50% of the plants are showing damage and are infested with larvae smaller than 2.5 cm, insecticide treatment may be warranted.<br><br><b>Fall armyworm:</b> Insecticide may be warranted if 50% of the plants are infested with unparasitized larvae smaller than 2.5 cm. However, damage is usually not economically significant unless infestations are high, and feeding is concentrated on the undeveloped tassels.<br><br>If larvae have white eggs attached to them, they are parasitized and may not need treatment. If larvae are 2.0 cm or larger, chemical control will not work well. Once the larvae are in the corn ear, insecticides cannot provide control. | chlorantraniliprole | Coragen                  | 250–375 mL/ha<br>(101–151 mL/acre) | field corn: 14<br>seed corn: 1   | Ground and aerial application. Apply to foliage when rain is not expected in the next 24 hr. Use a minimum of 100 L/ha of water. Maximum 4 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | carbaryl            | Sevin XLR Plus           | 2.5–4.0 L/ha<br>(1.0–1.6 L/acre)   | 1                                | For larvae in whorls and foliage, treat entire plant. Repeat as necessary. Follow label precautions regarding honeybees.<br><br>This product is highly toxic to honeybees exposed to direct treatment on blooming crops or weeds. Apply Sevin XLR Plus from late evening to early morning or when bees are not foraging.                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | lambda-cyhalothrin  | Matador 120 E            | 83–208 mL/ha<br>(34–84 mL/acre)    | silage: 14<br>field and seed: 21 | Ground and aerial application. For best results, apply in the early morning, before temperatures rise, or during the evening. Use 100–200 L water/ha for ground application, 10–40 L water/ha for aerial application. Spray no later than 10 days after egg hatch. Maximum 3 applications/yr. Do not apply more than 2 applications of 83 mL/ha by air. 24-hr re-entry period.<br><br>This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds.<br><b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.                                                          |
| Silencer 120 EC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                     | 83 mL/ha<br>(34 mL/acre) |                                    |                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| CORN LEAF APHID ( <i>Rhopalosiphum maidis</i> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                     |                          |                                    |                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| If 50% of all plants during the late-whorl-to-early-tassel stage have 400 aphids per plant, or if honeydew accumulation is impeding pollination and plants are under moisture stress, control is required. Control is not recommended once pollination has occurred.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | flupyradifurone     | Sivanto Prime            | 500–750 mL/ha<br>(202–303 mL/acre) | 21                               | The maximum amount of Sivanto Prime allowed per crop season is 2,000 mL/ha. Apply as a foliar application ensuring thorough coverage. Do not make any application of Sivanto Prime following soil, in-furrow or seed treatment applications of a Group 4D insecticide.<br><br>Toxic to adult bees in laboratory studies via oral exposure, however, not toxic to bees through contact exposure, and field studies conducted with this product have shown no effects on honeybee colony development. Minimize spray drift to reduce exposure to bees in habitats close to the application site. Application during the crop blooming period, and when flowering weeds are present, may only be made in the early morning and the evening when most bees are not foraging. |

## CORN INSECTS

**Table 1–8.** Chemical Control Options for Insects in Field and Seed Corn — Armyworm, Corn Leaf Aphid, Brown Marmorated Stink Bug, Potato Stem Borer, Slugs, Sap Beetles**LEGEND:** PHI = Pre-Harvest Interval (days)

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Active Ingredient | Trade Name    | Rate                        | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------------|-----------------------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>BROWN MARMORATED STINK BUG (<i>Halyomorpha halys</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                   |               |                             |     |                                                                                                                                                                                                                                                                   |
| This is a new invasive species in Ontario and is established in many urban areas of Ontario, though infestations have not been detected in crops in Ontario as of 2015. Brown marmorated stink bugs (BMSBs) are most likely to enter corn and soybean fields once the crop has an ear developing or a pod forming. Scout fields once a week, inspecting 5 areas within the first 12 m of the field's edge. No thresholds have been established for corn or soybeans in Ontario yet, though BMSB has been found to cause serious injury to host crops in the mid-Atlantic U.S. If this pest is found in corn or soybeans, please contact the OMAFRA Agricultural Information Contact Centre at: 1-877-424-1300 or <a href="mailto:ag.info.omafra@ontario.ca">ag.info.omafra@ontario.ca</a> . Management strategies are under development. Up-to-date information is available at <a href="http://ontario.ca/stinkbug">ontario.ca/stinkbug</a> . | malathion         | Malathion 85E | 1.345 L/ha<br>(544 mL/acre) | 5   | <b>Ground application only.</b> Use a minimum of 500 L water/ha. Toxic to bees exposed to direct treatment, drift or residues on flowering crops and weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. |
| <b>POTATO STEM BORER (<i>Hydraecia micacea</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                   |               |                             |     |                                                                                                                                                                                                                                                                   |
| No insecticides are registered.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                   |               |                             |     |                                                                                                                                                                                                                                                                   |
| <b>SLUGS (Various species)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                   |               |                             |     |                                                                                                                                                                                                                                                                   |
| Usually not an economic pest because growing point is not affected.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                   |               |                             |     |                                                                                                                                                                                                                                                                   |
| <b>SAP BEETLES (<i>Glischrochilus quadrisignatus</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                   |               |                             |     |                                                                                                                                                                                                                                                                   |
| Not an economic pest but can carry <i>Fusarium</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                   |               |                             |     |                                                                                                                                                                                                                                                                   |

## CORN INSECTS

**Table 1–9.** Chemical Control Options for Insects in Field and Seed Corn — Corn Earworm, Two-Spotted Spidermites**LEGEND:** PHI = Pre-Harvest Interval (days)

| Integrated Pest Management Options                                                                                                                                                                                                                                                  | Active Ingredient                        | Trade Name      | Rate                               | PHI                              | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-----------------|------------------------------------|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CORN EARWORM (CEW) (<i>Helicoverpa zea</i>)</b>                                                                                                                                                                                                                                  |                                          |                 |                                    |                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <p>Insecticides have generally not provided economic control of CEW in field corn. There may be some value in treating seed corn to maintain kernel quality.</p> <p>For best results, apply at or shortly after egg hatch. Target insecticides to cover the corn ear and silks.</p> | lambda-cyhalothrin                       | Matador 120 E   | 83–187 mL/ha<br>(34–76 mL/acre)    | silage: 14                       | Ground and aerial application. For best results, apply in the early morning, before temperatures rise, or during the evening. Use 100–200 L water/ha for ground application, 10–40 L water/ha for aerial application. Spray no later than 10 days after egg hatch. Maximum 3 applications/yr. Do not apply more than 2 applications of 83 mL/ha by air. 24-hr re-entry period. This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.                                                             |
|                                                                                                                                                                                                                                                                                     |                                          | Silencer 120 EC | 83 mL/ha<br>(34 mL/acre)           | field and seed: 21               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                     | cypermethrin                             | Mako            | 175 mL/ha<br>(70 mL/acre)          | 5                                | Ground and aerial application. Ensure good coverage of ears and silks. Use minimum 300–500 L/ha of water for ground application and 11–22 L/ha for aerial application. Maximum 3 applications/yr. Do not apply more than 2 applications by air. Re-entry period when foliage dries. Toxic to bees and other beneficial insects. Avoid spraying when bees are foraging.                                                                                                                                                                                                                                                                                                                                                                                            |
|                                                                                                                                                                                                                                                                                     | chlorantraniliprole                      | Coragen         | 250–375 mL/ha<br>(101–151 mL/acre) | field corn: 14<br>seed corn: 1   | Ground and aerial application. Apply to foliage when rain is not expected in the next 24 hr. Use a minimum of 100 L/ha of water. Maximum 4 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                     | lambda-cyhalothrin + chlorantraniliprole | Voliam Xpress   | 500 mL/ha<br>(200 mL/acre)         | silage: 14<br>field and seed: 21 | Apply no later than when the first feeding is seen. Re-apply after 7 days, depending on the presence of significant populations as determined by local monitoring. This treatment will not prevent internal cob damage if the insect has penetrated the ear. Allow a 7-day interval between treatments. For ground application — apply in a minimum of 150 L of water/ha. For aerial application — apply in a minimum of 40 L of water/ha. This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. |
| <b>TWO-SPOTTED SPIDERMITES (<i>Tetranychus urticae</i>)</b>                                                                                                                                                                                                                         |                                          |                 |                                    |                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Spidermites can be an economic pest in seed corn, particularly in hot, dry years. Populations can flare up shortly after applications of pyrethroid insecticides, as these insecticides control the natural enemies but have no activity on the pest.                               | spiromesifen                             | Oberon          | 400–600 mL/ha<br>(160–240 mL/acre) | field and seed: 30<br>silage: 5  | For use in field, seed and silage corn. Ground and aerial application. An adjuvant may be used to improve coverage and control. For best results, treat when mite populations begin to build and before a damaging population becomes established. This product is effective against the egg and nymph stages of whiteflies and mites. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 2 applications/yr. 12-hr re-entry period. May be toxic to bee brood. Bee brood may be exposed to residues on pollen and nectar brought back to the hive by bees foraging on flowering crops and weeds.                                                                                                         |

## Seed Corn

All seed corn should be treated with a fungicide seed treatment to prevent early-season preemergence and postemergent damping-off disease. This will help reduce seed decay and seedling blights. Corn seedling diseases are prevalent under cool wet conditions that keep the soil temperatures below 13°C. Low-lying or poorly drained areas of the field are often the first to show disease problems. Seed rots and seedling blights are more severe in no-till or reduced-tillage fields since heavy residue will keep soil cooler and wetter longer than in conventional fields. Damping-off will occur in conventional fields when the crop is planted early in conditions that favour disease development or when environmental conditions cause slow germination. Other factors that delay germination and emergence, such as compaction, crusting, deep planting, etc., can also result in a poor stand. Plant vigour is often reduced in those plants that do survive. Consult with your seed company and the Ontario Corn Committee Hybrid Performance Trials at [www.gocorn.net](http://www.gocorn.net) for hybrid selection.

## CORN DISEASES

**Table 1–10.** Chemical Control Options for Diseases in Seed Corn — Pythium Damping-Off

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                  | Active Ingredient                                                 | Trade Name            | Rate                                     | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|-----------------------|------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>PYTHIUM DAMPING-OFF (<i>Pythium</i> spp.)</b>                                                                                                                                                                                                                                                                                                                                                                    |                                                                   |                       |                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                               |                                                                   |                       |                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <p>This disease can occur on all soil types but losses are greatest in cold, wet clay soils. Minimize soil compaction and remove excess moisture through increased drainage. Plant when soil temperatures are above 13°C. There is no known resistance but some degree of tolerance is available in some hybrids. Crop rotation has limited effect.</p> <p>Consult with your seed company for hybrid selection.</p> | metalaxyl-M                                                       | Apron XL LS           | 20–40 mL/<br>100 kg seed                 | <b>For use in commercial seed treatment facilities only.</b> Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at or immediately before planting. Do not graze or cut for forage within 4 weeks after planting. Read label for information regarding resistant strains of fungus.                                                                                                                                                                                                                                                                                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                     | metalaxyl                                                         | Allegiance FL         | 46–110 mL/<br>100 kg seed                | For commercial and on-farm treating facilities. Do not graze or feed livestock on seeded area for 4 weeks after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                   | Apron FL              |                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                     | azoxystrobin                                                      | Dynasty 100 FS        | 10 mL/<br>100 kg seed                    | <b>For use in commercial seed treatment facilities only.</b> Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at or immediately before planting. Must be used in combination with Maxim XL for control of other corn diseases.                                                                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                     | thiabendazole<br>+ fludioxonil<br>+ metalaxyl-M<br>+ azoxystrobin | Maxim Quattro         | 67 mL/<br>100 kg seed                    | <b>For use in commercial seed-treating facilities only.</b> Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at, or immediately before, planting. Do not graze corn or cut for forage within 30 days of planting. This product contains no colourant. An appropriate colourant must be added when this product is applied to seed.                                                                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                     | penflufen<br>+ prothioconazole<br>+ metalaxyl                     | EverGol Energy        | 65 mL/<br>100 kg seed                    | For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied.                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                     | ethaboxam                                                         | INTEGO Solo Fungicide | 13–19.6 mL/100 kg<br>(5–7.5 g ai/100 kg) | For commercial and on-farm treating. Regulations under the <i>Seeds Act</i> require that an appropriate colourant must be added when this product is applied to seed. A red colourant must be added when this product is applied to grain.<br><br>For best results, use INTEGO Solo Fungicide combined with other oomycete-active seed treatment fungicides, such as metalaxyl, to broaden the spectrum of activity. INTEGO Solo Fungicide can also be used in combination with a broad-spectrum registered seed treatment fungicide having activity against <i>Rhizoctonia solani</i> and other fungal pathogens responsible for seed and seedling diseases. |

## CORN DISEASES

**Table 1–11.** Chemical Control Options for Diseases in Seed Corn — Rhizoctonia

| Integrated Pest Management Options                                                                                                                                                                             | Active Ingredient                                                 | Trade Name     | Rate                        | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|----------------|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>RHIZOCTONIA (<i>Rhizoctonia solani</i>)</b>                                                                                                                                                                 |                                                                   |                |                             |                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Seed Treatment</b>                                                                                                                                                                                          |                                                                   |                |                             |                                                                                                                                                                                                                                                                                                                                                                                              |
| This disease can occur on all soil types. There are no known resistant or tolerant hybrids available. Remove excess soil moisture through improved drainage. Plant seed when soil temperatures are above 13°C. | fludioxonil                                                       | Maxim 480 FS   | 5.2–10.4 mL/<br>100 kg seed | <b>For use in commercial seed treatment facilities only.</b> Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at or immediately before planting. Do not graze or cut for forage within 4 weeks after planting.                                                                                                                          |
|                                                                                                                                                                                                                | carbathiin<br>+ thiram                                            | Vitaflo 280    | 280 mL/<br>100 kg seed      | For commercial and on-farm treating facilities. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                                                                                                                                                                                                                                  |
|                                                                                                                                                                                                                | azoxystrobin                                                      | Dynasty 100 FS | 10 mL/<br>100 kg seed       | <b>For use in commercial seed treatment facilities only.</b> Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at or immediately before planting. Must be used in combination with Maxim XL for control of other corn diseases.                                                                                                          |
|                                                                                                                                                                                                                | ipconazole                                                        | Vortex FL      | 5.6 mL/<br>100 kg seed      | <b>For use in commercial seed treatment facilities only.</b> Use only in treating equipment that can accurately control application rates and provide good distribution of chemical onto seed in the mixing chamber. Not for use in hopper-box, planter-box, slurry-box or similar seed treatment applications. This product contains no dye. An appropriate seed colourant must be applied. |
|                                                                                                                                                                                                                | thiabendazole<br>+ fludioxonil<br>+ metalaxyl-M<br>+ azoxystrobin | Maxim Quattro  | 67 mL/<br>100 kg seed       | <b>For use in commercial seed-treating facilities only.</b> Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at, or immediately before, planting. Do not graze corn or cut for forage within 30 days of planting. This product contains no colourant. An appropriate colourant must be added when this product is applied to seed.      |
|                                                                                                                                                                                                                | penflufen<br>+ prothioconazole<br>+ metalaxyl                     | EverGol Energy | 65 mL/<br>100 kg seed       | For commercial and on-farm treating facilities. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied.                                                                                                                                                                                               |

## CORN DISEASES

**Table 1–12.** Chemical Control Options for Diseases in Seed Corn — Fusarium Seedling Blight

| Integrated Pest Management Options                                                                                                                                                                                                               | Active Ingredient                                                 | Trade Name     | Rate                        | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                         |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|----------------|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>FUSARIUM SEEDLING BLIGHT (<i>F. culmorum</i>, <i>F. graminearum</i> and <i>F. avenaceum</i>)</b>                                                                                                                                              |                                                                   |                |                             |                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Seed Treatment</b>                                                                                                                                                                                                                            |                                                                   |                |                             |                                                                                                                                                                                                                                                                                                                                                                                              |
| Some level of resistance or tolerance to this disease is available in some hybrids. Rotate with other crops. Tillage has little effect. Treat seed with fungicide and reduce early-season stresses. Plant when soil temperatures are above 13°C. | fludioxonil                                                       | Maxim 480 FS   | 5.2–10.4 mL/<br>100 kg seed | <b>For use in commercial seed treatment facilities only.</b> Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at or immediately before planting. Do not graze or cut for forage within 4 weeks after planting.                                                                                                                          |
|                                                                                                                                                                                                                                                  | carbathiin<br>+ thiram                                            | Vitaflo 280    | 280 mL/<br>100 kg seed      | <b>For use in commercial seed treatment facilities only.</b> Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                                                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                  | captan                                                            | Agrox FL       | 120 mL/<br>100 kg seed      | <b>For use in commercial seed treatment facilities only.</b> Mix with the amount of water required for the slurry treater equipment to be used.                                                                                                                                                                                                                                              |
|                                                                                                                                                                                                                                                  | trifloxystrobin                                                   | Trilex FS      | 21 mL/<br>100 kg seed       | <b>For use in commercial seed treatment facilities only.</b> Apply using standard commercial seed treatment equipment. Not for use in hopper-box, planter-box, slurry-box or similar seed treatment applications. Uniform application on seed is necessary to ensure seed safety and best disease protection.                                                                                |
|                                                                                                                                                                                                                                                  | ipconazole                                                        | Vortex FL      | 5.6 mL/<br>100 kg seed      | <b>For use in commercial seed treatment facilities only.</b> Use only in treating equipment that can accurately control application rates and provide good distribution of chemical onto seed in the mixing chamber. Not for use in hopper-box, planter-box, slurry-box or similar seed treatment applications. This product contains no dye. An appropriate seed colourant must be applied. |
|                                                                                                                                                                                                                                                  | thiabendazole<br>+ fludioxonil<br>+ metalaxyl-M<br>+ azoxystrobin | Maxim Quattro  | 67 mL/<br>100 kg seed       | <b>For use in commercial seed-treating facilities only.</b> Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at, or immediately before, planting. Do not graze corn or cut for forage within 30 days of planting. This product contains no colourant. An appropriate colourant must be added when this product is applied to seed.      |
|                                                                                                                                                                                                                                                  | penflufen<br>+ prothioconazole<br>+ metalaxyl                     | EverGol Energy | 65 mL/<br>100 kg seed       | For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied.                                                                                                                                                                                                          |

## CORN DISEASES

**Table 1–13.** Chemical Control Options for Diseases in Seed Corn — Aspergillus Seed Rot, Penicillium Seed Rot

| Integrated Pest Management Options                                                                                            | Active Ingredient                                                 | Trade Name     | Rate                        | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                    |
|-------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|----------------|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>ASPERGILLUS (<i>Aspergillus</i> spp.) SEED ROT</b>                                                                         |                                                                   |                |                             |                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Seed Treatment</b>                                                                                                         |                                                                   |                |                             |                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Aspergillus seed rot is occasionally a problem in Ontario.                                                                    | fludioxonil                                                       | Maxim 480 FS   | 5.2–10.4 mL/<br>100 kg seed | <b>For use in commercial seed treatment facilities only.</b> Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at or immediately before planting. Do not graze or cut for forage within 4 weeks after planting.                                                                                                                                                     |
|                                                                                                                               | ipconazole                                                        | Vortex FL      | 5.6 mL/<br>100 kg seed      | <b>For use in commercial seed treatment facilities only.</b> Use only in treating equipment that can accurately control application rates and provide good distribution of chemical onto seed in the mixing chamber. Not for use in hopper-box, planter-box, slurry-box or similar seed treatment applications. This product contains no dye. An appropriate seed colourant must be applied.                            |
|                                                                                                                               | thiabendazole<br>+ fludioxonil<br>+ metalaxyl-M<br>+ azoxystrobin | Maxim Quattro  | 67 mL/<br>100 kg seed       | <b>For use in commercial seed-treating facilities only.</b> Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at, or immediately before, planting. Do not graze corn or cut for forage within 30 days of planting. This product contains no colourant. An appropriate colourant must be added when this product is applied to seed.                                 |
|                                                                                                                               | penflufen<br>+ prothioconazole<br>+ metalaxyl                     | EverGol Energy | 65 mL/<br>100 kg seed       | For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied.                                                                                                                                                                                                                                     |
| <b>PENICILLIUM (<i>Penicillium oxalicum</i>) SEED ROT</b>                                                                     |                                                                   |                |                             |                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Seed Treatment</b>                                                                                                         |                                                                   |                |                             |                                                                                                                                                                                                                                                                                                                                                                                                                         |
| This disease prefers high temperatures and is found only until the nodal roots develop. Infected roots may appear blue-green. | fludioxonil                                                       | Maxim 480 FS   | 5.2–10.4 mL/<br>100 kg seed | <b>For use in commercial seed treatment facilities only.</b> Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at or immediately before planting. Do not graze or cut for forage within 4 weeks after planting.                                                                                                                                                     |
|                                                                                                                               | ipconazole                                                        | Vortex FL      | 5.6 mL/<br>100 kg seed      | <b>Provides suppression only. For use in commercial seed treatment facilities only.</b> Use only in treating equipment that can accurately control application rates and provide good distribution of chemical onto seed in the mixing chamber. Not for use in hopper-box, planter-box, slurry-box or similar seed treatment applications. This product contains no dye. An appropriate seed colourant must be applied. |
|                                                                                                                               | thiabendazole<br>+ fludioxonil<br>+ metalaxyl-M<br>+ azoxystrobin | Maxim Quattro  | 67 mL/<br>100 kg seed       | <b>For use in commercial seed-treating facilities only.</b> Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at, or immediately before, planting. Do not graze corn or cut for forage within 30 days of planting. This product contains no colourant. An appropriate colourant must be added when this product is applied to seed.                                 |
|                                                                                                                               | penflufen<br>+ prothioconazole<br>+ metalaxyl                     | EverGol Energy | 65 mL/<br>100 kg seed       | <b>Provides suppression only.</b> For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied.                                                                                                                                                                                                   |

## CORN DISEASES

**Table 1–14.** Chemical Control Options for Diseases in Field and Seed Corn — Common Rust

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                        | Active Ingredient             | Trade Name      | Rate                               | PHI                                                              | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------|------------------------------------|------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>COMMON RUST (<i>Puccinia sorghi</i> and <i>Puccinia polysora</i>)</b>                                                                                                                                                                                                                                                                                  |                               |                 |                                    |                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Rust is generally not a problem in Ontario except when infection begins early in the season. Field corn has good resistance compared to seed corn, sweet corn and specialty corn hybrids. As a result, foliar fungicides in field corn are not needed unless significant disease appears before corn tassels. Humid, cool conditions favour this disease. | azoxystrobin + propiconazole  | Quilt           | 0.75–1.0 L/ha<br>(305–406 mL/acre) | 30                                                               | Ground and aerial application. Apply when disease first appears, followed by a second application 14 days after, if environmental conditions are favourable for disease development. Do not apply to field corn or field corn grown for seed after brown silk. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                           | azoxystrobin                  | Quadris         | 453 mL/ha<br>(183 mL/acre)         | 7                                                                | Ground and aerial application. Apply prior to disease development. Second application may be made 7–14 days later. Maximum 2 applications/yr. Do not re-enter treated area until residues have dried.                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                           | pyraclostrobin                | Headline EC     | 400–600 mL/ha<br>(160–240 mL/acre) | 7                                                                | Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha. Do not graze treated crop within 6 days of last application. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                             |
|                                                                                                                                                                                                                                                                                                                                                           | propiconazole                 | Tilt 250 E      | 500 mL/ha<br>(200 mL/acre)         | 14                                                               | Ground and aerial application. Apply when rust pustules first appear. Under severe disease pressure, a second application 14 days later may be necessary. Only in seed corn, under severe disease pressure, can a third application be made 14 days later. Can be tank-mixed with Mako or Matador for insect control.                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                           |                               | Bumper 418 EC   | 300 mL/ha<br>(121 mL/acre)         |                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                                                                           | pyraclostrobin + fluxapyroxad | Priaxor         | 300 mL/ha<br>(120 mL/acre)         | 21                                                               | Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                           | prothioconazole               | Proline 480 SC  | 315–420 mL/ha<br>(127–170 mL/acre) | 24 hr<br>OR<br>20 days<br>for hand-<br>detasselling<br>seed corn | Ground and aerial application. Maximum 1 application per year. 24-hr re-entry period.<br><b>EXCEPTION:</b> 20 days for hand-harvesting sweet corn and hand-detasselling seed corn. Apply Proline 480 SC Foliar Fungicide as a preventive foliar spray when the earliest disease symptoms appear on the leaves and stems. Observe fields closely for early disease symptoms, particularly under prolonged conditions favourable for disease development. Under high disease pressure, use a non-ionic surfactant with Proline 480 SC Foliar Fungicide (do not apply a non-ionic surfactant prior to tassel emergence, as crop injury may occur). |
|                                                                                                                                                                                                                                                                                                                                                           | penthiopyrad                  | Vertisan        | 1–1.75 L/ha<br>(0.4–0.7 L/acre)    | 7                                                                | Ground and aerial application. Begin applications prior to disease development and continue on a 7–14-day interval. Use higher rate and shorter interval when disease pressure is high. Do not apply more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 3.5 L/ha/yr. 12-hr re-entry period, 3 days if detasselling.                                                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                           | propiconazole + tebuconazole  | Stratego 250 EC | 730–880 mL/ha<br>(295–356 mL/acre) | 14                                                               | Ground and aerial application. Use the higher rate when disease pressure is severe. Do not apply more than 2 applications of Stratego 250 EC per season. Do not apply to sweet corn within 14 days of harvest.                                                                                                                                                                                                                                                                                                                                                                                                                                  |

## CORN DISEASES

**Table 1–15.** Chemical Control Options for Diseases in Field and Seed Corn — Northern Corn Blight, Helminthosporium Leaf Spot**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                | Active Ingredient             | Trade Name      | Rate                                | PHI                                                              | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-----------------|-------------------------------------|------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>NORTHERN CORN LEAF BLIGHT (<i>Setosphaeria turcica</i>)</b>                                                                                                                                                                                                                                                                                                                                                                    |                               |                 |                                     |                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Risk of this disease is on the rise in Ontario. Consult with your seed company for hybrid selection. Seed corn may need protection. Crop rotation and tillage will reduce inoculum levels in surface residues. In reduced tillage systems, rotation and resistance are necessary. Chemical control is not usually economical in field corn.                                                                                       | azoxystrobin + propiconazole  | Quilt           | 0.75–1.0 L/ha<br>(305–406 mL/acre)  | 30                                                               | Ground and aerial application. Apply when disease first appears, followed by a second application 14 days after, if environmental conditions are favourable for disease development. Do not apply to field corn or field corn grown for seed after brown silk. Maximum 2 applications/yr.                                                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                   | propiconazole                 | Tilt 250 E      | 250–500 mL/ha<br>(100–200 mL/acre)  | 14                                                               | Ground and aerial application. Apply when rust pustules first appear. Under severe disease pressure, a second application 14 days later may be necessary. Only in seed corn, under severe disease pressure, can a third application be made 14 days later. Can be tank-mixed with Mako or Matador for insect control.                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                   |                               | Bumper 418 EC   | 150–300 mL/ha<br>(60–121 mL/acre)   |                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                   | pyraclostrobin + fluxapyroxad | Priaxor         | 300 mL/ha<br>(120 mL/acre)          | 21                                                               | Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                   | prothioconazole               | Proline 480 SC  | 315–420 mL/ha<br>(127–170 mL/acre)  | 24 hr<br>OR<br>20 days<br>for hand-<br>detasselling<br>seed corn | Ground and aerial application. Maximum 1 application/yr. 24-hr re-entry period. <b>EXCEPTION:</b> 20 days for hand-harvesting sweet corn and hand-detasselling seed corn. Apply Proline 480 SC foliar fungicide as a preventive foliar spray when the earliest disease symptoms appear on the leaves and stems. Fields should be observed closely for early disease symptoms, particularly under prolonged conditions favourable for disease development. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                   | picoxystrobin                 | Acapela         | 0.53–0.8 L/ha<br>(0.21–0.32 L/acre) | 7                                                                | Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Use high rate and shorter interval when disease pressure is high. Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha/season. 12-hr re-entry period.                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                   | propiconazole + tebuconazole  | Stratego 250 EC | 730–880 mL/ha<br>(295–356 mL/acre)  | 14                                                               | Ground and aerial application. Use the higher rate when disease pressure is severe. Do not apply more than 2 applications of Stratego 250 EC per season. Do not apply to sweet corn within 14 days of harvest.                                                                                                                                                                                                                                            |
| <b>HELMINTHOSPORIUM LEAF SPOT (<i>Cochliobolus carbonum</i>)</b>                                                                                                                                                                                                                                                                                                                                                                  |                               |                 |                                     |                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| This disease is not generally a problem in Ontario, since hybrids with resistance are available. Consult with your seed company for hybrid selection. Crop rotation and tillage will reduce inoculum levels in surface residues. In reduced tillage systems, rotation and resistance are necessary. Chemical control is usually not economical in field corn but may be necessary if a very susceptible seed corn inbred is used. | propiconazole                 | Tilt 250 E      | 250–500 mL/ha<br>(100–200 mL/acre)  | 14                                                               | Ground and aerial application. Apply when rust pustules first appear. Under severe disease pressure, a second application 14 days later may be necessary. Only in seed corn, under severe disease pressure, can a third application be made 14 days later. Can be tank-mixed with Mako or Matador for insect control.                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                   |                               | Bumper 418 EC   | 150–300 mL/ha<br>(60–121 mL/acre)   |                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

## CORN DISEASES

**Table 1–16.** Chemical Control Options for Diseases in Field Corn — Eye Spot, Southern Corn Leaf Blight

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                            | Active Ingredient                | Trade Name         | Rate                               | PHI                                                              | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|--------------------|------------------------------------|------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>EYE SPOT (<i>Aureobasidium zeae</i> or <i>Kabatiella zeae</i>)</b>                                                                                                                                                                                                                                                                                                                         |                                  |                    |                                    |                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Many resistant or tolerant commercial hybrids are available. Consult with your seed company for hybrid selection. Crop rotation and tillage will reduce inoculum levels in surface residues. In reduced tillage systems, rotation and resistance are necessary. Chemical control is usually not economical in field corn but may be necessary if a very susceptible seed corn inbred is used. | pyraclostrobin                   | Headline EC        | 400–600 mL/ha<br>(160–240 mL/acre) | 7                                                                | Ground and aerial application. Use a minimum water volume of 100 L/ha. For optimal disease control, begin applications prior to disease development. Do not graze treated crop within 6 days of last application. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                               | azoxystrobin<br>+ propiconazole  | Quilt              | 0.75–1.0 L/ha<br>(305–406 mL/acre) | 30                                                               | Ground and aerial application. Apply when disease first appears, followed by a second application 14 days after, if environmental conditions are favourable for disease development. Do not apply to field corn or field corn grown for seed after brown silk. Maximum 2 applications/yr.                                                                                                                                                                                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                               | propiconazole                    | Tilt 250 E         | 500 mL/ha<br>(200 mL/acre)         | 14                                                               | Ground and aerial application. Apply when rust pustules first appear. Under severe disease pressure, a second application 14 days later may be necessary. Only in seed corn, under severe disease pressure, can a third application be made 14 days later. Can be tank-mixed with Mako or Matador for insect control.                                                                                                                                                                                                                                                                                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                               |                                  | Bumper<br>418 EC   | 300 mL/ha<br>(121 mL/acre)         |                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                                                                                                                                                                                                                                                                                                                                                               | pyraclostrobin<br>+ fluxapyroxad | Priaxor            | 300 mL/ha<br>(120 mL/acre)         | 21                                                               | <b>Suppression only.</b> For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                               | prothioconazole                  | Proline<br>480 SC  | 315–420 mL/ha<br>(127–170 mL/acre) | 24 hr<br>OR<br>20 days<br>for hand-<br>detasselling<br>seed corn | Ground and aerial application. Maximum 1 application/yr. 24-hr re-entry period.<br><br><b>EXCEPTION:</b> 20 days for hand-harvesting sweet corn and hand-detasselling seed corn. Apply Proline 480 SC foliar fungicide as a preventive foliar spray when the earliest disease symptoms appear on the leaves and stems. Observe fields closely for early disease symptoms, particularly under prolonged conditions favourable for disease development. Under high disease pressure, use a non-ionic surfactant with Proline 480 SC foliar fungicide (do not apply a non-ionic surfactant prior to tassel emergence, as crop injury may occur). |
|                                                                                                                                                                                                                                                                                                                                                                                               | propiconazole<br>+ tebuconazole  | Stratego<br>250 EC | 730–880 mL/ha<br>(295–356 mL/acre) | 14                                                               | Ground and aerial application. Use the higher rate when disease pressure is severe. Do not apply more than 2 applications of Stratego 250 EC per season. Do not apply to sweet corn within 14 days of harvest.                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>SOUTHERN CORN LEAF BLIGHT (<i>Cochliobolus heterostrophus</i>)</b>                                                                                                                                                                                                                                                                                                                         |                                  |                    |                                    |                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Was a major concern in the 1970s, but with the switch from cytoplasm male sterile T to normal cytoplasm corn, the disease is not considered to be a threat.                                                                                                                                                                                                                                   | azoxystrobin<br>+ propiconazole  | Quilt              | 0.75–1.0 L/ha<br>(305–406 mL/acre) | 30                                                               | Ground and aerial application. Apply when disease first appears, followed by a second application 14 days after, if environmental conditions are favourable for disease development. Do not apply to field corn or field corn grown for seed after brown silk. Maximum 2 applications/yr.                                                                                                                                                                                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                               | propiconazole                    | Tilt 250 E         | 250–500 mL/ha<br>(100–200 mL/acre) | 14                                                               | Ground and aerial application. Apply when disease first appears. Can be tank-mixed with Mako or Matador for insect control. Under severe disease pressure, a second application 14 days later may be necessary. Only in seed corn, under severe disease pressure can a third application be made 14 days later.                                                                                                                                                                                                                                                                                                                               |
|                                                                                                                                                                                                                                                                                                                                                                                               |                                  | Bumper<br>418 EC   | 150–300 mL/ha<br>(60–121 mL/acre)  |                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## CORN DISEASES

**Table 1–17.** Chemical Control Options for Diseases in Field and Seed Corn — Grey Leaf Spot, Nematodes**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                             | Active Ingredient                    | Trade Name                 | Rate                               | PHI                                                              | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|----------------------------|------------------------------------|------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| GREY LEAF SPOT ( <i>Cercospora zeae-maydis</i> )                                                                                                                                                                                                                                                                                                                               |                                      |                            |                                    |                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| This disease is becoming more common in Southwestern Ontario. Some hybrids are tolerant/resistant to the disease. Consult with your seed company for hybrid selection. Crop rotation and tillage will reduce inoculum levels in surface residues. In reduced tillage systems, rotation and resistance are necessary. Chemical control is usually not economical in field corn. | pyraclostrobin                       | Headline EC                | 400–600 mL/ha<br>(160–240 mL/acre) | 7                                                                | Ground and aerial application. Use a minimum water volume of 100 L/ha. For optimal disease control, begin applications prior to disease development. Do not graze treated crop within 6 days of last application. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                                                                                                | azoxystrobin<br>+ propiconazole      | Quilt                      | 0.75–1.0 L/ha<br>(305–406 mL/acre) | 30                                                               | Ground and aerial application. Apply when disease first appears, followed by a second application 14 days after, if environmental conditions are favourable for disease development. Do not apply to field corn or field corn grown for seed after brown silk. Maximum 2 applications/yr.                                                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                | pyraclostrobin<br>+ fluxapyroxad     | Priaxor                    | 300 mL/ha<br>(120 mL/acre)         | 21                                                               | Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                | prothioconazole                      | Proline 480 SC             | 315–420 mL/ha<br>(127–170 mL/acre) | 24 hr<br>OR<br>20 days<br>for hand-<br>detasselling<br>seed corn | Ground and aerial application. Maximum 1 application per year. 24-hr re-entry period.<br><br><b>EXCEPTION:</b> 20 days for hand-harvesting sweet corn and hand-detasselling seed corn. Apply Proline 480 SC foliar fungicide as a preventive foliar spray when the earliest disease symptoms appear on the leaves and stems. Observe fields closely for early disease symptoms, particularly under prolonged conditions favourable for disease development. Under high disease pressure, use a non-ionic surfactant with Proline 480 SC foliar fungicide (do not apply a non-ionic surfactant prior to tassel emergence, as crop injury may occur). |
|                                                                                                                                                                                                                                                                                                                                                                                | penthiopyrad                         | Vertisan                   | 1–1.75 L/ha<br>(0.4–0.7 L/acre)    | 7                                                                | Ground and aerial application. Begin applications prior to disease development and continue on a 7–14-day interval. Use higher rate and shorter interval when disease pressure is high. Do not apply more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 3.5 L/ha/yr. 12-hr re-entry period, 3 days if detasselling.                                                                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                | propiconazole                        | Tilt 250 E                 | 500 mL/ha<br>(200 mL/acre)         | 14                                                               | Ground and aerial application. Apply when rust pustules first appear. Under severe disease pressure, a second application 14 days later may be necessary. Only in seed corn, under severe disease pressure, can a third application be made 14 days later. Can be tank-mixed with Mako or Matador for insect control.                                                                                                                                                                                                                                                                                                                               |
| Bumper 418 EC                                                                                                                                                                                                                                                                                                                                                                  |                                      | 300 mL/ha<br>(121 mL/acre) |                                    |                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| NEMATODES: NEEDLE ( <i>Longidorus</i> spp.), ROOT LESION ( <i>Pratylenchus</i> spp.), ROOT KNOT ( <i>Meloidogyne</i> spp.)                                                                                                                                                                                                                                                     |                                      |                            |                                    |                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Corn nematodes are difficult to diagnose in the field without a lab test. Unfortunately symptoms are misdiagnosed for other problems. Above-ground symptoms typically include stunting, yellowing and uneven stands while root symptoms may include lesions, discolouration, lack of root hairs and/or stunted root growth.                                                    | <i>Bacillus firmus</i> strain I-1582 | Votivo 240 FS              | 0.042–0.42 mL/<br>1,000 seeds      | N/A                                                              | Check with your seed corn dealer for availability and co-pack formulations.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

## CORN DISEASES

**Table 1–18.** Chemical Control Options for Diseases in Field Corn — Stalk Rot, Fusarium and Gibberella Ear Rots**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Active Ingredient | Trade Name     | Rate                       | PHI                                                              | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|----------------|----------------------------|------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>STALK ROT suppression only (<i>Fusarium</i>, <i>Gibberella</i> and <i>Colletotrichum</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                   |                |                            |                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Foliar Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                   |                |                            |                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <p>The distribution and prevalence of stalk and ear rot diseases vary from year to year. However, the diseases are present in most years even though at low levels. The majority of stalk rot damage in Ontario is caused by three fungi, namely <i>Anthraco</i>se, <i>Gibberella</i> and <i>Fusarium</i>. However, <i>Diplodia</i> and <i>Pythium</i> have also been observed in Ontario.</p> <p>Management begins by reducing crop stresses through planting hybrids that have good resistance or tolerance to leaf diseases and stalk rots, managing insects, good weed control, appropriate plant populations, a balanced N and K fertility program, crop rotation and tillage.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | prothioconazole   | Proline 480 SC | 420 mL/ha<br>(170 mL/acre) | 14                                                               | Ground and aerial application. Maximum 1 application/yr. 24-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>FUSARIUM (<i>Fusarium</i> spp.) and GIBBERELLA (<i>Gibberella</i> spp.) EAR ROTS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                   |                |                            |                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <p>Any of the <i>Fusarium</i> or <i>Gibberella</i> rots can establish after pollination in wounds created by insects or birds. Warm rainy weather or long dews any time after pollination may lead to ear rots in these wounded cobs. The most common and important ear mould in Ontario is <i>Gibberella zeae</i>, which is the sexual reproductive stage of <i>Fusarium graminearum</i>. Many plant pathologists believe that in years with a high occurrence of fusarium head blight in wheat, the potential exists for increased gibberella ear rot in corn. These ear rots are especially important to swine and other livestock producers since they produce mycotoxins that can have a detrimental effect on the animals. Preventing ear rots is difficult since weather conditions are critical to disease development. Although some tolerant hybrids are available, none have complete resistance. Consult with your seed company for hybrid selection. Harvest fields as soon as possible if 10% of the ears have some ear rot to limit further disease development and potential mycotoxins production.</p> <p>See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i>, for more information.</p> | prothioconazole   | Proline 480 SC | 420 mL/ha<br>(170 mL/acre) | 24 hr<br>OR<br>20 days<br>for hand-<br>detasselling<br>seed corn | <p><b>Provides suppression only.</b> Ground and aerial application. Timing of application is critical. Apply from development stage of corn between the tip of stigmata visible (silking BBCH 63) to the stigmata drying (silk browning BBCH 67). This product will reduce both disease symptoms and levels of mycotoxin in the grain. Maximum 1 application/yr. 24-hr re-entry period.</p> <p><b>EXCEPTION:</b> 20 days for hand-harvesting sweet corn and hand-detasselling seed corn. Under high disease pressure, use a non-ionic surfactant with Proline 480 SC foliar fungicide (do not apply a non-ionic surfactant prior to tassel emergence, as crop injury may occur).</p> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | metconazole       | Caramba        | 1.0 L<br>(400 mL)          | 20                                                               | <p><b>Provides suppression only.</b> Ground and aerial application. Apply to corn when the crop is between silking (GS 63) and silk browning (GS 67). It is important to have good spray coverage on the silks to ensure optimum efficacy. Maximum 1 application/yr. Re-entry interval is 12 hr.</p> <p><b>EXCEPTION:</b> 18 days for hand harvesting. Pre-harvest interval is 20 days for field corn grain and popcorn grain. Pre-harvest interval for sweet corn cobs is 7 days for mechanical harvesting and 18 days for hand harvesting.</p>                                                                                                                                     |

## 2. Soybeans

Bee kill incidences in Ontario have been found to be associated with the planting of corn and soybean seed treated with neonicotinoid. Growers are encouraged to follow best management practices to protect pollinators at planting. See Health Canada's pollinator protection web page: [www.healthcanada.gc.ca/pollinators](http://www.healthcanada.gc.ca/pollinators) and Chapter 10 as well as [ontario.ca/neonics](http://ontario.ca/neonics) for the latest information. Consult your seed company and the Ontario Soybean and Canola Committee (OSACC) at [www.gosoy.ca](http://www.gosoy.ca) for variety information.

### SOYBEAN INSECTS

**Table 2–1.** Chemical Control Options for Insects in Soybeans — Seedcorn Maggot

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Active Ingredient                                                                    | Trade Name                                                                                           | Rate                                                                   | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SEEDCORN MAGGOT (<i>Delia platura</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                      |                                                                                                      |                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Seed Treatment</b> — For all seed treatments, use full rate and ensure good coverage of seed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                      |                                                                                                      |                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <p>In Ontario, the use of neonicotinoid seed treatments on corn and soybean seed is restricted. See Chapter 10 for further information on the requirements to use these products.</p> <p>Factors that increase the risk of seedcorn maggot are early-planted fields where large amounts of manure, green manure or residue have been recently incorporated or when cool conditions unfavourable for emergence are expected.</p> <p><b>NOTE:</b> The planting of neonicotinoid-treated corn and soybean seed can pose a risk to pollinators. This includes all clothianidin, imidacloprid and thiamethoxam products. The contaminated insecticide dust emitted from pneumatic planters can drift onto flower and water sources and expose bees to these insecticides. Growers are encouraged to follow best management practices (BMPs) to protect pollinators at planting. To help minimize the dust generated during planting, refer to <i>Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices</i> on the Health Canada website at <a href="http://www.healthcanada.gc.ca/pollinators">www.healthcanada.gc.ca/pollinators</a>.</p> | thiamethoxam<br>( <b>See NOTE.</b> )                                                 | Cruiser 5 FS                                                                                         | 50–83 mL/<br>100 kg seed                                               | <b>For use in commercial seed treatment facilities only.</b> Use higher rate when insect populations are expected to be high. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | thiamethoxam<br>+ metalaxyl-M<br>+ fludioxonil<br>( <b>See NOTE.</b> )               | Cruiser Maxx Beans                                                                                   | 195 mL/<br>100 kg seed                                                 | <b>For use in commercial seed treatment facilities only.</b> Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | thiamethoxam<br>+ metalaxyl-M<br>+ fludioxonil<br>+ sedaxane<br>( <b>See NOTE.</b> ) | Cruiser Maxx Beans<br>+<br>Vibrance 500 FS<br>(sold as a co-pack:<br>Cruiser Maxx<br>Vibrance Beans) | 195 mL<br>+<br>5–10 mL/<br>100 kg seed<br>(2.5–5 g ai/<br>100 kg seed) | <b>For use in commercial seed treatment facilities only.</b> Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | imidacloprid<br>( <b>See NOTE.</b> )                                                 | Stress Shield 600                                                                                    | 104–208 mL/<br>100 kg seed<br>(62.5–125 g ai/<br>100 kg seed)          | <b>For use in commercial seed treatment facilities only.</b> For control of certain seed and soil-borne pathogens in legume seeds and seedlings, Stress Shield 600 may be mixed with the following seed treatment fungicides: Trilex AL, Trilex AL Concentrate, Trilex FS, Allegiance, EverGol Energy, Apron Max RFC and Apron Max RTA. Follow all appropriate directions and precautions as specified on the fungicide labels. Make sure that the specific legume crop to be treated is registered on the fungicide partner as well. Do not apply any subsequent application of a Group 4 insecticide (neonicotinoids) (e.g., in-furrow or foliar application following treatment) with Stress Shield 600. Use high rate for early seeding, when insect populations are expected to be high or extended control period for aphids is needed. This product contains no colourant. Seed treated with this product must be conspicuously coloured. Do not graze or feed livestock on treated areas for 4 weeks after planting. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                      | Sombrero 600 FS                                                                                      | 104–208 mL/<br>100 kg seed                                             | For use in commercial and on-farm seed treatment. Apply through slurry applicator seed treaters, which provide uniform seed coverage. Maintain constant agitation of the slurry during application. Do not apply any subsequent application of a Group 4 insecticide (e.g., in-furrow, soil or foliar application) following a soil, in-furrow or seed treatment with Sombrero.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                      | Alias 240 SC                                                                                         | 260–520 mL/<br>100 kg seed                                             | Do not use in commercial seed treatment facilities. Apply through slurry applicator seed treaters, which provide uniform seed coverage. Maintain constant agitation of the slurry during application. Do not apply any subsequent application of a Group 4 insecticide (e.g., in-furrow, soil or foliar application) following a soil, in-furrow or seed treatment with ALIAS 240 SC.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

## SOYBEAN INSECTS

Table 2–2. Chemical Control Options for Insects in Soybeans — Soybean Aphid

| LEGEND: PHI = Pre-Harvest Interval (in days)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                             | N/A = not applicable                                                                                 |                                                                        |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Active Ingredient                                                           | Trade Name                                                                                           | Rate                                                                   | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>SOYBEAN APHID (<i>Aphis glycines</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                             |                                                                                                      |                                                                        |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                             |                                                                                                      |                                                                        |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <p>Foliar treatment at threshold is the recommended method of control.</p> <p>In Ontario, the use of neonicotinoid seed treatments on corn and soybean seed is restricted. See Chapter 10 for further information on the requirements to use these products.</p> <p>Clothianidin, thiamethoxam and imidacloprid may not be used as soybean seed treatment solely for protection from soybean aphid. However, seed treatments for the control of other soil insect pests may provide early-season protection (up to 40 days after planting) from early infestations of soybean aphids. These early-season infestations are more likely to occur in Eastern Ontario.</p> <p><b>NOTE:</b> The planting of neonicotinoid-treated corn and soybean seed can pose a risk to pollinators. This includes all clothianidin, imidacloprid and thiamethoxam products. The contaminated insecticide dust emitted from pneumatic planters can drift onto flower and water sources and expose bees to these insecticides. Growers are encouraged to follow best management practices (BMPs) to protect pollinators at planting. To help minimize the dust generated during planting, refer to <i>Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices</i> on the Health Canada website at <a href="http://www.healthcanada.gc.ca/pollinators">www.healthcanada.gc.ca/pollinators</a>.</p> | thiamethoxam<br>(See NOTE.)                                                 | Cruiser 5 FS                                                                                         | 83 mL/<br>100 kg seed                                                  | N/A | <b>For soybeans grown under contract for seed production only.</b> The use of neonicotinoid seed treatments solely for protection against soybean aphids is not permitted on commercial soybeans. <b>For use in commercial seed treatment facilities only.</b> Provides only early-season protection against soybean aphids and will not protect crop against typical mid-to-late-season aphid infestations.                                                                                                                                                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | thiamethoxam<br>+ metalaxyl-M<br>+ fludioxonil<br>(See NOTE.)               | Cruiser Maxx Beans                                                                                   | 195 mL/<br>100 kg seed                                                 | N/A | <b>For soybeans grown under contract for seed production only.</b> The use of neonicotinoid seed treatments solely for protection against soybean aphids is not permitted on commercial soybeans. <b>For use in commercial seed treatment facilities only.</b> Provides early-season protection. Will not protect crop against typical mid-to-late-season aphid infestations. Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | thiamethoxam<br>+ metalaxyl-M<br>+ fludioxonil<br>+ sedaxane<br>(See NOTE.) | Cruiser Maxx Beans<br>+<br>Vibrance 500 FS<br>(sold as a co-pack:<br>Cruiser Maxx<br>Vibrance Beans) | 195 mL<br>+<br>5–10 mL/<br>100 kg seed<br>(2.5–5 g ai/<br>100 kg seed) | N/A | <b>For soybeans grown under contract for seed production only.</b> The use of neonicotinoid seed treatments solely for protection against soybean aphids is not permitted on commercial soybeans. <b>For use in commercial seed treatment facilities only.</b> Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                |

## SOYBEAN INSECTS

**Table 2-2.** Chemical Control Options for Insects in Soybeans — Soybean Aphid

| <b>Integrated Pest Management Options</b>             |                             | <b>Active Ingredient</b> | <b>Trade Name</b>                                             | <b>Rate</b>                | <b>PHI</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>Comments (label precautions, re-entry periods, etc.)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------------------------------------|-----------------------------|--------------------------|---------------------------------------------------------------|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SOYBEAN APHID (<i>Aphis glycines</i>) (cont'd)</b> |                             |                          |                                                               |                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Seed Treatment (cont'd)</b>                        |                             |                          |                                                               |                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| (cont'd)                                              | imidacloprid<br>(See NOTE.) | Stress Shield 600        | 104–208 mL/<br>100 kg seed<br>(62.5–125 g ai/<br>100 kg seed) | N/A                        | <p><b>For soybeans grown under contract for seed production only.</b> The use of neonicotinoid seed treatments solely for protection against soybean aphids is not permitted on commercial soybeans. <b>For use in commercial seed treatment facilities only.</b> For control of certain seed and soil-borne pathogens in legume seeds and seedlings, Stress Shield 600 may be mixed with the following seed treatment fungicides: Trilex AL, Trilex AL Concentrate, Trilex FS, Allegiance, EverGol Energy, Apron Max RFC and Apron Max RTA. Follow all appropriate directions and precautions as specified on the fungicide labels. Make sure that the specific legume crop to be treated is registered on the fungicide partner as well.</p> <p>Do not apply any subsequent application of a Group 4 insecticide (neonicotinoids) (e.g., in-furrow or foliar application following treatment) with Stress Shield 600.</p> <p>Use high rate for early seeding, when insect populations are expected to be high or extended control period for aphids is needed. This product contains no colourant. Seed treated with this product must be conspicuously coloured. Do not graze or feed livestock on treated areas for 4 weeks after planting.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                                       |                             |                          | Sombrero 600 FS                                               | 104–208 mL/<br>100 kg seed | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <p>For use in commercial and on-farm seed treatment equipment.</p> <p><b>For soybeans grown under contract for seed production only.</b> The use of neonicotinoid seed treatments solely for protection against soybean aphids is not permitted on commercial soybeans. Apply through slurry applicator seed treaters that provide uniform seed coverage. Maintain constant agitation of the slurry during application. Do not apply any subsequent application of a Group 4 insecticide (e.g., in-furrow, soil or foliar application) following a soil, in-furrow or seed treatment with Sombrero.</p> |
|                                                       |                             |                          | Alias 240 SC                                                  | 260–520 mL/<br>100 kg seed | N/A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <p><b>For soybeans grown under contract for seed production only.</b> The use of neonicotinoid seed treatments solely for protection against soybean aphids is not permitted on commercial soybeans. Do not use in commercial seed treatment facilities. Apply through slurry applicator seed treaters that provide uniform seed coverage. Maintain constant agitation of the slurry during application. Do not apply any subsequent application of a Group 4 insecticide (e.g., in-furrow, soil or foliar application) following a soil, in-furrow or seed treatment with Alias 240 SC.</p>            |

## SOYBEAN INSECTS

**Table 2–2.** Chemical Control Options for Insects in Soybeans — Soybean Aphid

| <b>LEGEND:</b> PHI = Pre-Harvest Interval (in days)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                             | N/A = not applicable |                                    |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
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| <b>Integrated Pest Management Options</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Active Ingredient</b>    | <b>Trade Name</b>    | <b>Rate</b>                        | <b>PHI</b> | <b>Comments (label precautions, re-entry periods, etc.)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>SOYBEAN APHID (<i>Aphis glycines</i>) (cont'd)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                             |                      |                                    |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Foliar Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                             |                      |                                    |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <p>Foliar treatment is the recommended method of control for soybean aphids. Aphid infestations are more likely to cause yield reduction if the plants are already suffering from drought conditions or another stress factor.</p> <p>Scout fields frequently. Apply foliar insecticide when threshold of “250 aphids per plant with increasing populations” has been reached in the R1–R5 stage of soybeans. If aphid populations do not appear to be on the increase above 250 per plant, do not apply insecticide, as it will kill off the beneficial insects that are keeping the aphid population in check. Aphids are then likely to increase quickly in the absence of their predators and could easily reach threshold.</p> <p>For further information on scouting techniques, thresholds and management options, see OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i>.</p> | lambda-cyhalothrin          | Matador 120 E        | 83–233 mL/ha<br>(34–94 mL/acre)    | 21         | <p>Ground and aerial application. For best results, apply during the early morning, before temperatures rise, or during the evening. Use higher rate when conditions favour rapidly increasing populations or when crop canopies are dense, resulting in poor spray coverage. Select nozzle size, type and pressure to produce a medium spray. Use 100–200 L water/ha for ground application, 10–40 L water/ha for aerial application. Maximum 3 applications/yr. 24-hr re-entry period.</p> <p>This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.</p> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                             | Silencer 120 EC      | 83–233 mL/ha<br>(34–94 mL/acre)    | 21         | <p><b>Ground application only.</b> For best results, apply during the early morning, before temperatures rise, and during the evening. Maximum 3 applications/yr. 24-hr re-entry period.</p> <p>This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.</p>                                                                                                                                                                                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | dimethoate                  | Cygon 480 EC         | 1 L/ha<br>(400 mL/acre)            | 30         | <p>Ground and aerial application. Use high volume, high pressure and ensure good coverage. Maximum 3 applications/yr.</p> <p>This product is toxic to bees. Restrict application to the period after dark when bees are inside their hives, or in the early morning before the bees are foraging in the fields. Do not apply to such crops as alfalfa when in full bloom.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                             | Lagon 480 EC         |                                    |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | imidacloprid + deltamethrin | Concept              | 325–650 mL/ha<br>(131–263 mL/acre) | 20         | <p>Do not apply this product if following a seed treatment or soil application of a Group 4 insecticide (neonicotinoids) within that season. Ground or aerial application. Use high rate for fastest knockdown and best residual control. Minimum of 5 days between applications. Maximum 3 applications/yr. 24-hr re-entry period.</p> <p>This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area.</p>                                                                                                                                                                                                                                                              |

## SOYBEAN INSECTS

**Table 2-2.** Chemical Control Options for Insects in Soybeans — Soybean Aphid

| <b>Integrated Pest Management Options</b>             |                                      | <b>Active Ingredient</b> | <b>Trade Name</b>                  | <b>Rate</b> | <b>PHI</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Comments (label precautions, re-entry periods, etc.)</b> |
|-------------------------------------------------------|--------------------------------------|--------------------------|------------------------------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| <b>SOYBEAN APHID (<i>Aphis glycines</i>) (cont'd)</b> |                                      |                          |                                    |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                             |
| <b>Foliar Treatment (cont'd)</b>                      |                                      |                          |                                    |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                             |
| (cont'd)                                              | thiamethoxam<br>+ lambda-cyhalothrin | Endigo                   | 180 mL/ha<br>(73 mL/acre)          | 30          | <p>Base the need and timing of application on the presence of vulnerable pest developmental stages and significant populations as determined by local monitoring. Allow at least 7 days between treatments. Do not graze or harvest treated forage, straw or hay for livestock feed. Do not apply this product within 45 days of planting if seeds were treated with a neonicotinoid product. Do not exceed a total of 540 mL/ha of Endigo per season. Maximum of 3 applications/yr. Use a minimum of 100–200 L of water/ha for ground applications and 20 L of water/ha for aerial application.</p> <p>Toxic to bees. To minimize exposure to bees from foliar application, <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.</p> |                                                             |
|                                                       | spirotetramat                        | Movento                  | 185–275 mL/ha<br>(75–111 mL/acre)  | 21          | <p>Soybeans may be treated by ground or aerial application equipment. The minimum interval between applications is 7 days. A maximum of 730 mL/ha of Movento is allowed per crop season. Movento must be tank-mixed with a spray adjuvant/additive having spreading and penetrating properties to maximize leaf uptake and systemicity of the active ingredient within treated plants. Please see label for suggested adjuvants. The efficacy of Movento may not be apparent for 10–21 days.</p> <p>This product is toxic to bee brood. Bee brood may be exposed to residues in/on pollen and nectar brought back to the hive by bees foraging on flowering crops and weeds. <b>DO NOT</b> apply during crop flowering period or when flowering weeds are present in the treatment area.</p>                                                                                             |                                                             |
|                                                       | flupyradifurone                      | Sivanto Prime            | 500–750 mL/ha<br>(202–303 mL/acre) | 7           | <p>The maximum amount of Sivanto Prime allowed per crop season is 2,000 mL/ha. Apply as a foliar application ensuring thorough coverage. Do not make any application of Sivanto Prime following soil, in-furrow or seed treatment applications of a Group 4D insecticide.</p> <p>Toxic to adult bees in laboratory studies via oral exposure, however, not toxic to bees through contact exposure, and field studies conducted with this product have shown no effects on honeybee colony development. Minimize spray drift to reduce exposure to bees in habitats close to the application site. Application during the crop blooming period and when flowering weeds are present may only be made in the early morning and the evening when most bees are not foraging.</p>                                                                                                            |                                                             |

## SOYBEAN INSECTS

**Table 2–2.** Chemical Control Options for Insects in Soybeans — Soybean Aphid

| <b>LEGEND:</b> PHI = Pre-Harvest Interval (in days)   |                                             | N/A = not applicable |                            |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------------------------------------------------------|---------------------------------------------|----------------------|----------------------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Integrated Pest Management Options                    | Active Ingredient                           | Trade Name           | Rate                       | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>SOYBEAN APHID (<i>Aphis glycines</i>) (cont'd)</b> |                                             |                      |                            |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Foliar Treatment (cont'd)</b>                      |                                             |                      |                            |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| (cont'd)                                              | lambda-cyhalothrin<br>+ chlorantraniliprole | Voliam Xpress        | 500 mL/ha<br>(200 mL/acre) | 21  | <p><b>DO NOT</b> use more than 3 applications per season by ground application. <b>DO NOT</b> use more than 1 application per season by aerial application. Re-apply after 7 days, depending on the presence of significant populations as determined by local monitoring. Apply in a minimum of 100–200 L of water/ha for ground application. Apply in a minimum of 40 L of water/ha for aerial application.</p> <p>This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.</p> |

## SOYBEAN INSECTS

Table 2-3. Chemical Control Options for Insects in Soybeans — Bean Leaf Beetle

| LEGEND: PHI = Pre-Harvest Interval (in days)      N/A = not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                             |                                                                                                      |                                                                        |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Active Ingredient                                                           | Trade Name                                                                                           | Rate                                                                   | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>BEAN LEAF BEETLE (<i>Certoma trifurcata</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                             |                                                                                                      |                                                                        |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                             |                                                                                                      |                                                                        |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <p>In Ontario, the use of neonicotinoid seed treatments on corn and soybean seed is restricted. See Chapter 10 for further information on the requirements to use these products.</p> <p>Seed treatments may provide early-season protection (up to 40 days after planting) from early infestations of bean leaf beetle. Fields with a history of early-season infestation from overwintering adults are at a higher risk and should be scouted regularly. Fields in southwestern counties of Ontario, in particular, tend to experience injury to the seedling crop from early infestations of beetles.</p> <p><b>NOTE:</b> The planting of neonicotinoid-treated corn and soybean seed can pose a risk to pollinators. This includes all clothianidin, imidacloprid and thiamethoxam products. The contaminated insecticide dust emitted from pneumatic planters can drift onto flower and water sources and expose bees to these insecticides. Growers are encouraged to follow best management practices (BMPs) to protect pollinators at planting. To help minimize the dust generated during planting, refer to <i>Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices</i> on the Health Canada website at <a href="http://www.healthcanada.gc.ca/pollinators">www.healthcanada.gc.ca/pollinators</a>.</p> | thiamethoxam<br>(See NOTE.)                                                 | Cruiser 5 FS                                                                                         | 83 mL/<br>100 kg seed                                                  | N/A | <b>For use in commercial seed treatment facilities only.</b> To reduce early-season defoliation. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | thiamethoxam<br>+ metalaxyl-M<br>+ fludioxonil<br>(See NOTE.)               | Cruiser Maxx Beans                                                                                   | 195 mL/<br>100 kg seed                                                 | N/A | <b>For use in commercial seed treatment facilities only.</b> To reduce early-season defoliation. Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | thiamethoxam<br>+ metalaxyl-M<br>+ fludioxonil<br>+ sedaxane<br>(See NOTE.) | Cruiser Maxx Beans<br>+<br>Vibrance 500 FS<br>(sold as a co-pack:<br>Cruiser Maxx<br>Vibrance Beans) | 195 mL<br>+<br>5–10 mL/<br>100 kg seed<br>(2.5–5 g ai/<br>100 kg seed) | N/A | <b>For use in commercial seed treatment facilities only.</b> Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | imidacloprid<br>(See NOTE.)                                                 | Stress Shield 600                                                                                    | 104–208 mL/<br>100 kg seed<br>(62.5–125 g ai/<br>100 kg seed)          | N/A | <b>For use in commercial seed treatment facilities only.</b> For control of certain seed and soil-borne pathogens in legume seeds and seedlings, Stress Shield 600 may be mixed with the following seed treatment fungicides: Trilex AL, Trilex AL Concentrate, Trilex FS, Allegiance, EverGol Energy, Apron Max RFC and Apron Max RTA. Follow all appropriate directions and precautions as specified on the fungicide labels. Make sure that the specific legume crop to be treated is registered on the fungicide partner as well.<br><br>Do not apply any subsequent application of a Group 4 insecticide (neonicotinoids) (e.g., in-furrow or foliar application following treatment) with Stress Shield 600.<br><br>Use high rate for early seeding, when insect populations are expected to be high or extended control period for aphids is needed. This product contains no colourant. Seed treated with this product must be conspicuously coloured. Do not graze or feed livestock on treated areas for 4 weeks after planting. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                             | Sombrero 600 FS                                                                                      | 104–208 mL/<br>100 kg seed                                             | N/A | For use in commercial and on-farm seed treatment equipment. Apply through slurry applicator seed treaters, which provide uniform seed coverage. Maintain constant agitation of the slurry during application. Do not apply any subsequent application of a Group 4 insecticide (e.g., in-furrow, soil or foliar application) following a soil, in-furrow or seed treatment with Sombrero.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                             | Alias 240 SC                                                                                         | 260–520 mL/<br>100 kg seed                                             | N/A | Do not use in commercial seed treatment facilities. Apply through slurry applicator seed treaters, which provide uniform seed coverage. Maintain constant agitation of the slurry during application. Do not apply any subsequent application of a Group 4 insecticide (e.g., in-furrow, soil or foliar application) following a soil, in-furrow or seed treatment with Alias 240 SC.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

## SOYBEAN INSECTS

**Table 2–3.** Chemical Control Options for Insects in Soybeans — Bean Leaf Beetle

| <b>LEGEND:</b> PHI = Pre-Harvest Interval (in days)      N/A = not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                |                   |                                    |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-------------------|------------------------------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Integrated Pest Management Options</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Active Ingredient</b>       | <b>Trade Name</b> | <b>Rate</b>                        | <b>PHI</b> | <b>Comments (label precautions, re-entry periods, etc.)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>BEAN LEAF BEETLE (<i>Certoma trifurcata</i>) (cont'd)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                |                   |                                    |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Foliar Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                |                   |                                    |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <p>For protection from overwintering adults, in areas with a history of injury, consider using insecticide seed treatment for early-planted soybeans.</p> <p>Bean leaf beetle populations rarely cause enough defoliation after the seedling stages to require a foliar insecticide application in Ontario. Defoliation thresholds are listed in the OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i>.</p> <p>Food-grade and seed soybeans may require protection, especially during the later R5 and R6 pod stages to reduce pod disease development caused by beetle feeding. If 10% of pods have feeding damage, insecticide may be necessary. Pay attention to pre-harvest intervals when spraying during the R6 stage of soybeans.</p> | lambda-cyhalothrin             | Matador 120 E     | 83–233 mL/ha<br>(34–94 mL/acre)    | 21         | <p>Ground and aerial application. For best results, apply during the early morning, before temperatures rise, or during the evening. Use 100–200 L water/ha for ground application, 10–40 L water/ha for aerial application. Maximum 3 applications/yr. 24-hr re-entry period.</p> <p>This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.</p> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                | Silencer 120 EC   | 83–233 mL/ha<br>(34–94 mL/acre)    | 21         | <p><b>Ground application only.</b> For best results, apply during the early morning, before temperatures rise, and during the evening. Maximum 3 applications/yr. 24-hr re-entry period.</p> <p>This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.</p>                                                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | dimethoate                     | Cygon 480 EC      | 0.7–1 L/ha<br>(280–400 mL/acre)    | 30         | <p>Ground and aerial application. Use sufficient water volume to ensure good coverage. Maximum 3 applications/yr.</p> <p>This product is toxic to bees. Restrict application to the period after dark when bees are inside the hives, or in the early morning before the bees are foraging in the fields. <b>DO NOT</b> apply to such crops as alfalfa when in full bloom.</p>                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                | Lagon 480 EC      |                                    |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | imidacloprid<br>+ deltamethrin | Concept           | 325–650 mL/ha<br>(131–263 mL/acre) | 20         | <p><b>Suppression only.</b> Do not apply this product if following a seed treatment or soil application of a Group 4 insecticide (neonicotinoid) within that season. Ground or aerial application. Use high rate for fastest knockdown and best residual control. Minimum of 5 days between applications. Maximum 3 applications/yr. 24-hr re-entry period.</p> <p>This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area.</p>                            |

## SOYBEAN INSECTS

**Table 2–3.** Chemical Control Options for Insects in Soybeans — Bean Leaf Beetle

| <b>Integrated Pest Management Options</b>                    |                                             | <b>Active Ingredient</b> | <b>Trade Name</b>                 | <b>Rate</b> | <b>PHI</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Comments (label precautions, re-entry periods, etc.)</b> |
|--------------------------------------------------------------|---------------------------------------------|--------------------------|-----------------------------------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| <b>BEAN LEAF BEETLE (<i>Certoma trifurcata</i>) (cont'd)</b> |                                             |                          |                                   |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                             |
| <b>Foliar Treatment (cont'd)</b>                             |                                             |                          |                                   |             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                             |
| (cont'd)                                                     | thiamethoxam<br>+ lambda-cyhalothrin        | Endigo                   | 180 mL/ha<br>(73 mL/acre)         | 30          | <p>Base the need and timing of application on the presence of vulnerable pest developmental stages and significant populations as determined by local monitoring. Allow at least 7 days between treatments. Do not graze or harvest treated forage, straw or hay for livestock feed. Do not apply this product within 45 days of planting if seeds were treated with a neonicotinoid product. Do not exceed a total of 540 mL/ha of Endigo per season. Maximum of 3 applications/yr. Use a minimum of 100–200 L of water/ha for ground applications and 20 L of water/ha for aerial application.</p> <p>Toxic to bees. To minimize exposure to bees from foliar application, <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.</p> |                                                             |
|                                                              | spirotetramat                               | Movento                  | 185–275 mL/ha<br>(75–111 mL/acre) | 21          | <p>Soybeans may be treated by ground or aerial application equipment. The minimum interval between applications is 7 days. A maximum of 730 mL/ha of Movento is allowed per crop season. Movento must be tank-mixed with a spray adjuvant/additive having spreading and penetrating properties to maximize leaf uptake and systemicity of the active ingredient within treated plants. Please see label for suggested adjuvants. The efficacy of Movento may not be apparent for 10–21 days.</p> <p>This product is toxic to bee brood. Bee brood may be exposed to residues in/on pollen and nectar brought back to the hive by bees foraging on flowering crops and weeds. <b>DO NOT</b> apply during crop flowering period or when flowering weeds are present in the treatment area.</p>                                                                                             |                                                             |
|                                                              | lambda-cyhalothrin<br>+ chlorantraniliprole | Voliam Xpress            | 500 mL/ha<br>(200 mL/acre)        | 21          | <p><b>DO NOT</b> use more than 3 applications per season by ground application. <b>DO NOT</b> use more than 1 application per season by aerial application. Re-apply after 7 days, depending on the presence of significant populations as determined by local monitoring. Apply in a minimum of 100–200 L of water/ha for ground application. Apply in a minimum of 40 L of water/ha for aerial application.</p> <p>This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.</p>                                                                                                                                          |                                                             |

## SOYBEAN INSECTS

Table 2–4. Chemical Control Options for Insects in Soybeans — Wireworm

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Active Ingredient                                                           | Trade Name                                                                                           | Rate                                                                   | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>WIREWORM (<i>Limonius</i> spp.)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                             |                                                                                                      |                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                             |                                                                                                      |                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <p>In Ontario, the use of neonicotinoid seed treatments on corn and soybean seed is restricted. See Chapter 10 for further information on the requirements to use these products.</p> <p>Factors that impact wireworm populations include early-planted fields where large amounts of manure, green manure or residue have been recently incorporated or when cool conditions unfavourable for emergence are expected.</p> <p><b>NOTE:</b> The planting of neonicotinoid-treated corn and soybean seed can pose a risk to pollinators. This includes all clothianidin, imidacloprid and thiamethoxam products. The contaminated insecticide dust emitted from pneumatic planters can drift onto flower and water sources and expose bees to these insecticides. Growers are encouraged to follow best management practices (BMPs) to protect pollinators at planting. To help minimize the dust generated during planting, refer to <i>Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices</i> on the Health Canada website at <a href="http://www.healthcanada.gc.ca/pollinators">www.healthcanada.gc.ca/pollinators</a>.</p> | thiamethoxam<br>(See NOTE.)                                                 | Cruiser 5 FS                                                                                         | 50–83 mL/<br>100 kg seed                                               | <b>For use in commercial seed treatment facilities only.</b> Use higher rate when insect populations are expected to be high. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | thiamethoxam<br>+ metalaxyl-M<br>+ fludioxonil<br>(See NOTE.)               | Cruiser Maxx Beans                                                                                   | 195 mL/<br>100 kg seed                                                 | <b>For use in commercial seed treatment facilities only.</b> Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | thiamethoxam<br>+ metalaxyl-M<br>+ fludioxonil<br>+ sedaxane<br>(See NOTE.) | Cruiser Maxx Beans<br>+<br>Vibrance 500 FS<br>(sold as a co-pack:<br>Cruiser Maxx<br>Vibrance Beans) | 195 mL<br>+<br>5–10 mL/<br>100 kg seed<br>(2.5–5 g ai/<br>100 kg seed) | <b>For use in commercial seed treatment facilities only.</b> Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | imidacloprid<br>(See NOTE.)                                                 | Stress Shield 600                                                                                    | 104–208 mL/<br>100 kg seed<br>(62.5–125 g ai/<br>100 kg seed)          | <p><b>For use in commercial seed treatment facilities only.</b> For control of certain seed and soil-borne pathogens in legume seeds and seedlings, Stress Shield 600 may be mixed with the following seed treatment fungicides: Trilex AL, Trilex AL Concentrate, Trilex FS, Allegiance, EverGol Energy, Apron Max RFC and Apron Max RTA. Follow all appropriate directions and precautions as specified on the fungicide labels. Make sure that the specific legume crop to be treated is registered on the fungicide partner as well.</p> <p>Do not apply any subsequent application of a Group 4 insecticide (neonicotinoids) (e.g., in-furrow or foliar application following treatment) with Stress Shield 600.</p> <p>Use high rate for early seeding, when insect populations are expected to be high or extended control period for aphids is needed. This product contains no colourant. Seed treated with this product must be conspicuously coloured. Do not graze or feed livestock on treated areas for 4 weeks after planting.</p> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                             | Sombrero 600 FS                                                                                      | 104–208 mL/<br>100 kg seed                                             | For use in commercial and on-farm seed treatment equipment. Apply through slurry applicator seed treaters, which provide uniform seed coverage. Maintain constant agitation of the slurry during application. Do not apply any subsequent application of a Group 4 insecticide (e.g., in-furrow, soil or foliar application) following a soil, in-furrow or seed treatment with Sombrero.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                             | Alias 240 SC                                                                                         | 260–520 mL/<br>100 kg seed                                             | Do not use in commercial seed treatment facilities. Apply through slurry applicator seed treaters, which provide uniform seed coverage. Maintain constant agitation of the slurry during application. Do not apply any subsequent application of a Group 4 insecticide (e.g., in-furrow, soil or foliar application) following a soil, in-furrow or seed treatment with Alias 240 SC.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

## SOYBEAN INSECTS

Table 2–5. Chemical Control Options for Insects in Soybeans — Grubs, Marmorated Stink Bug

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Active Ingredient                                       | Trade Name         | Rate                                                          | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------|--------------------|---------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>GRUBS — EUROPEAN CHAFER (<i>Rhizotrogus majalis</i>) and JAPANESE BEETLE (<i>Popillia japonica</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                         |                    |                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                         |                    |                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| In Ontario, the use of neonicotinoid seed treatments on corn and soybean seed is restricted. See Chapter 10 for further information on the requirements to use these products.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | thiamethoxam<br>(See NOTE.)                             | Cruiser 5 FS       | 83 mL/<br>100 kg seed                                         | <b>For European chafer only. For use in commercial seed treatment facilities only.</b> Use higher rate when insect populations are expected to be high. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>NOTE:</b> The planting of neonicotinoid-treated corn and soybean seed can pose a risk to pollinators. This includes all clothianidin, imidacloprid and thiamethoxam products. The contaminated insecticide dust emitted from pneumatic planters can drift onto flower and water sources and expose bees to these insecticides. Growers are encouraged to follow best management practices (BMPs) to protect pollinators at planting. To help minimize the dust generated during planting, refer to <i>Pollinator Protection and Responsible Use of Treated Seed — Best Management Practices</i> on the Health Canada website at <a href="http://www.healthcanada.gc.ca/pollinators">www.healthcanada.gc.ca/pollinators</a> .                                                                                                                                                                                  | thiamethoxam + metalaxyl-M + fludioxonil<br>(See NOTE.) | Cruiser Maxx Beans | 195 mL/<br>100 kg seed                                        | <b>For European chafer only. For use in commercial seed treatment facilities only.</b> Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | imidacloprid<br>(See NOTE.)                             | Stress Shield 600  | 104–208 mL/<br>100 kg seed<br>(62.5–125 g ai/<br>100 kg seed) | For European chafer and Japanese beetle grubs. <b>For use in commercial seed treatment facilities only.</b> For control of certain seed- and soil-borne pathogens in legume seeds and seedlings, Stress Shield 600 may be mixed with the following seed treatment fungicides: Trilex AL, Trilex AL Concentrate, Trilex FS, Allegiance, EverGol Energy, Apron Max RFC and Apron Max RTA. Follow all appropriate directions and precautions as specified on the fungicide labels. Make sure that the specific legume crop to be treated is registered on the fungicide partner as well.<br><br>Do not apply any subsequent application of a Group 4 insecticide (neonicotinoids) (e.g., in-furrow or foliar application following treatment) with Stress Shield 600.<br><br>This product contains no colourant. Seed treated with this product must be conspicuously coloured. Do not graze or feed livestock on treated areas for 4 weeks after planting. |
| <b>BROWN MARMORATED STINK BUG (<i>Halyomorpha halys</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                         |                    |                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| This is a new invasive species in Ontario and is established in many urban areas of Ontario, though infestations have not been detected in crops in Ontario as of 2015. BMSBs are most likely to enter corn and soybean fields once the crop has an ear developing or a pod forming.<br><br>Scout fields once a week, inspecting five areas within the first 12 m of the field's edge. No thresholds have been established for corn or soybeans in Ontario yet, though it has been found to cause serious injury to host crops in the mid-Atlantic U.S. If this pest is found in corn or soybeans, contact the OMAFRA Agricultural Information Contact Centre at 1-877-424-1300 or <a href="mailto:ag.info.omafra@ontario.ca">ag.info.omafra@ontario.ca</a> . Management strategies are under development. Up-to-date information is available at <a href="http://ontario.ca/stinkbug">ontario.ca/stinkbug</a> . |                                                         |                    |                                                               | No products currently registered for BMSB on soybeans.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

## SOYBEAN INSECTS

**Table 2–6.** Chemical Control Options for Insects in Soybeans — Two-Spotted Spidermites, Japanese Beetle, Potato Leafhopper, Slugs**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Active Ingredient           | Trade Name   | Rate                               | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|--------------|------------------------------------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TWO-SPOTTED SPIDERMITES ( <i>Tetranychus uricae</i> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                             |              |                                    |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Foliar application                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                             |              |                                    |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Scout fields in the first week of July. Infestations usually move in from edge of field as hot spots. Spot spray when populations average 4 mites per leaf. Do not use a pyrethroid insecticide (e.g., Matador) for the control of spidermites, as it will kill the beneficial mites and cause the spidermite populations to increase.                                                                                                                                                                                                                                                                                                                                                            | dimethoate                  | Cygon 480 EC | 1 L/ha<br>(400 mL/acre)            | 30  | Ground and aerial application. Use sufficient water volume to ensure good coverage. Maximum 2 applications/yr.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                             | Lagon 480 EC |                                    |     | Toxic to adult bees in laboratory studies via oral exposure, however, not toxic to bees through contact exposure, and field studies conducted with this product have shown no effects on honeybee colony development. Minimize spray drift to reduce exposure to bees in habitats close to the application site. Application during the crop blooming period, and when flowering weeds are present, may only be made in the early morning and the evening when most bees are not foraging. This product is toxic to bees. Restrict application to the period after dark when bees are inside the hives, or in the early morning before the bees are foraging in the fields. Do not apply to such crops as alfalfa when in full bloom. |
| JAPANESE BEETLE ADULTS ( <i>Popillia japonica</i> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                             |              |                                    |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Foliar application                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                             |              |                                    |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| This pest is most commonly found in the Niagara/Hamilton region, though it is known to be present across Ontario. If the defoliation by adults exceeds the thresholds, insecticide applications may be necessary. Defoliation thresholds for soybeans are available in OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> .                                                                                                                                                                                                                                                                                                                                                            | imidacloprid + deltamethrin | Concept      | 325–650 mL/ha<br>(131–263 mL/acre) | 20  | Ground or aerial application. Use high rate for fastest knockdown and best residual control. Do not apply this product if following a seed treatment or soil application of a Group 4 insecticide (neonicotinoid) within that season. Minimum of 5 days between applications. Maximum 3 applications/yr. 24-hr re-entry period.<br><br>This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area.                                                                                                                                                                                 |
| POTATO LEAFHOPPER ( <i>Empoasca fabae</i> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                             |              |                                    |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Foliar application                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                             |              |                                    |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Potato leafhoppers are controlled in soybeans by plant resistance through leaf pubescence. Problems are rare in soybeans in Ontario. Food grade soybeans may need protection.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | dimethoate                  | Cygon 480 EC | 0.7–1 L/ha<br>(280–400 mL/acre)    | 30  | Ground and aerial application. Use sufficient water volume to ensure good coverage. Maximum 3 applications/yr.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                             | Lagon 480 EC |                                    |     | This product is toxic to bees. Restrict application to the period after dark when bees are inside the hives, or in the early morning before the bees are foraging in the fields. Do not apply to such crops as alfalfa when in full bloom.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| SLUGS (Various species)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                             |              |                                    |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| No chemical control available. Slugs often avoid contact by feeding below ground, and dew and rainfall easily wash any product used away from the slugs and leaves. Ensure seed slots are closed during planting. Growers with fields with a history of significant slug damage should consider using some form of tillage to eliminate significant residue, exposing the slugs to dehydration and predation. Zone tillage or row sweepers can help speed up the drying of the row area, thus deterring slug feeding. Moving trash away from seedlings may also help reduce damage. See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , for rotation and tillage recommendations. |                             |              |                                    |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

## SOYBEAN DISEASES

**Table 2–7.** Chemical Control Options for Diseases in Soybeans — Soybean Cyst Nematode, Phytophthora Root Rot

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Active Ingredient           | Trade Name | Rate                                     | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|------------|------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SOYBEAN CYST NEMATODE (<i>Heterodera glycines</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                             |            |                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                             |            |                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <p>Soybean cyst nematode (SCN) is often confused with other common problems such as nutrient deficiencies, herbicide injury, soil compaction, drought, flooding or root rots. By the time above-ground symptoms from SCN feeding become noticeable, most fields have lost 25%–30% yield potential to the nematode. Early detection through scouting and soil testing is critical. If you suspect SCN, plants should be carefully dug (not pulled) and soil gently removed from the roots. Cysts are white to yellow and about the size of a pinhead. Rotating non-host crops such as corn, wheat, alfalfa or vegetable crops such as tomatoes, with resistant varieties, will lower SCN populations and improve yields on SCN-infested fields. In addition, rotation of SCN-resistant varieties is recommended to reduce shifts in the nematode population.</p> <p>For more information, see OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i>.</p> | <i>Pasteuria nishizawae</i> | CLARIVA pn | 10 million spores per seed (100 kg seed) | <p><b>For commercial seed treatment facilities only.</b></p> <p>To determine the amount (mL) of CLARIVA pn required to treat 100 kg of seed, use the following formula:</p> <p>Rate per 100 kg seed (mL/100 kg seed) = 10,000,000 spores per seed ÷ product guarantee (spores/mL) x seed size (seeds/kg) x 100 kg seed</p> <p>This product does not contain a colourant. A suitable colourant must be added to the slurry prior to application to the seed. Dilute in sufficient water to achieve thorough and even coverage to the seed.</p> |

## SOYBEAN DISEASES

**Table 2–7.** Chemical Control Options for Diseases in Soybeans — Soybean Cyst Nematode, Phytophthora Root Rot

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Active Ingredient                                            | Trade Name                                                                                           | Rate                                                                   | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>PHYTOPHTHORA ROOT ROT (<i>Phytophthora sojae</i>) — Suppression only</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                              |                                                                                                      |                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                              |                                                                                                      |                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Select soybean varieties that have both specific resistance (Rps genes such as 1K and 1C) and good partial resistance (tolerance) to all races of <i>Phytophthora</i> . Consult with your seed company and the Ontario Soybean and Canola Committee (OSACC) Variety Trial Results at <a href="http://www.gosoy.ca">www.gosoy.ca</a> for variety profiles. This disease is primarily controlled through resistant varieties. Crop losses are greatest in cold, wet, clay soils. Try to minimize soil compaction and remove excess moisture through improved drainage. A small amount of tillage will help warm the soil and improve surface drainage. Rotate soybeans with corn and wheat. Plant seed when soil temperatures are above 13°C. | fludioxonil<br>+ metalaxyl-M                                 | Apron Maxx RTA                                                                                       | 325 mL/<br>100 kg seed                                                 | For both commercial seed treatment plants and on-farm treatment using standard gravity- or mist-type seed treatment equipment. Provides early-season protection for tolerant varieties. If target fields have a history of high <i>Phytophthora</i> pressure, or if susceptible varieties are to be treated, tank-mix with 31 mL/100 kg seed of Apron XL LS. Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers prior to use. Ensure uniform coverage.                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                              | Apron Maxx RFC                                                                                       | 100 mL<br>+ 230 mL of water/<br>100 kg seed                            | For commercial and on-farm treating. Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting. Provides early-season protection against phytophthora root rot for tolerant varieties of soybeans. If target fields have a history of high pressure or if susceptible varieties are to be treated, tank-mix with 31 mL of Apron XL LS/100 kg seed.                                                                                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | thiamethoxam<br>+ metalaxyl-M<br>+ fludioxonil               | Cruiser Maxx Beans                                                                                   | 195 mL/<br>100 kg seed                                                 | <b>For use in commercial treatment facilities only.</b> Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting. Provides early-season protection against phytophthora root rot for tolerant varieties of soybeans. If target fields have a history of high pressure or if susceptible varieties are to be treated, tank-mix with 31 mL of Apron XL LS/100 kg of seed.                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | thiamethoxam<br>+ metalaxyl-M<br>+ fludioxonil<br>+ sedaxane | Cruiser Maxx Beans<br>+<br>Vibrance 500 FS<br>(sold as a co-pack:<br>Cruiser Maxx<br>Vibrance Beans) | 195 mL<br>+<br>5–10 mL/<br>100 kg seed<br>(2.5–5 g ai/<br>100 kg seed) | <b>For use in commercial treatment facilities only.</b> Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting. Provides early-season protection against phytophthora root rot for tolerant varieties of soybeans. If target fields have a history of high pressure or if susceptible varieties are to be treated, tank-mix with 31 mL of Apron XL LS/100 kg of seed.                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | penflufen<br>+ prothioconazole<br>+ metalaxyl                | EverGol Energy                                                                                       | 5 mL/<br>100 kg seed                                                   | For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions. For control of early-season phytophthora in soybean, product may be tank-mixed with metalaxyl and metalaxyl-M but see tank-mix partner label.                                                                                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | metalaxyl-M                                                  | Apron XL-LS                                                                                          | 40 mL/<br>100 kg seed                                                  | <b>For use in commercial seed treating only.</b> Do not graze or feed livestock on seeded area for 4 weeks after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | metalaxyl                                                    | Allegiance FL<br>Apron FL                                                                            | 46–93 mL/<br>100 kg seed                                               | For commercial and on-farm treating. Do not graze or feed livestock on seeded area for 4 weeks after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ethaboxam                                                    | Intego Solo<br>Fungicide                                                                             | 19.6 mL/<br>100 kg seed                                                | For commercial and on-farm treating. Regulations under the Seeds Act require that an appropriate colourant be added when this product is applied to seed.<br><br>For best results, use Intego Solo fungicide combined with other oomycete-active seed treatment fungicides, such as metalaxyl, to broaden the spectrum of activity. Intego Solo fungicide can also be used in combination with a broad-spectrum registered seed treatment fungicide having activity against <i>Rhizoctonia solani</i> and other fungal pathogens inciting seed and seedling disease. |

## SOYBEAN DISEASES

Table 2–8. Chemical Control Options for Diseases in Soybeans — Phomopsis Seed Mould

| LEGEND: PHI = Pre-Harvest Interval (in days)                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                     |                                                                                       | N/A = not applicable                                    |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Active Ingredient                                   | Trade Name                                                                            | Rate                                                    | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |
| PHOMOPSIS SEED MOULD ( <i>Phomopsis longicolla</i> )                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                     |                                                                                       |                                                         |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |
| Seed Treatment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                     |                                                                                       |                                                         |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |
| This disease is most severe when cool, wet conditions delay harvest. Some varieties are more susceptible than others. Consult with your seed company for variety profiles. Fungicide seed treatments will improve the germination of low to moderately infected seed. Do not plant severely infected seed. Plant good-quality seed with a germination rate of at least 80%–90%. Rotate with non-host crops such as corn and wheat, remove excess surface residue and harvest as early as possible. | carbathiin + thiram                                 | Anchor                                                                                | 600 mL/ 100 kg seed                                     | N/A | <b>For drill box application.</b> Ensure uniform coverage on seed. Do not apply Anchor through commercial seed-treating equipment or through an auger, as excessive seed wetness may result. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                                                                                                                                                                                               |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                     | Vitaflo 280                                                                           | 260 mL/ 100 kg seed                                     | N/A | <b>For use in commercial seed treatment facilities only.</b> Do not store treated soybean seed. May be applied through commercial seed treatment equipment or auger. Ensure uniform coverage.                                                                                                                                                                                                                                                                                                          |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | captan                                              | Agrox FL                                                                              | 280 mL/ 100 kg seed                                     | N/A | <b>For commercial seed treatment facilities only.</b> Mix with the amount of water required for the slurry treater equipment to be used.                                                                                                                                                                                                                                                                                                                                                               |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | fludioxonil                                         | Maxim 480 FS                                                                          | 5.2–10.4 mL/ 100 kg seed                                | N/A | <b>For use in commercial seed treatment facilities only.</b> Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications or immediately before planting. Do not graze treated crops or cut for forage within 30 days of planting.                                                                                                                                                                                                                            |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | fludioxonil + metalaxyl-M                           | Apron Maxx RTA                                                                        | 325 mL/ 100 kg seed                                     | N/A | For both commercial seed treatment plants and on-farm treatment using standard gravity- or mist-type seed treatment equipment. Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers prior to use. Ensure uniform coverage.                                                                                                                                                                                                                                           |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                     | Apron Maxx RFC                                                                        | 100 mL + 230 mL of water/ 100 kg seed                   | N/A | For commercial and on-farm treating. Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                                                                                                                      |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | thiamethoxam + metalaxyl-M + fludioxonil            | Cruiser Maxx Beans                                                                    | 195 mL/ 100 kg seed                                     | N/A | <b>For use in commercial seed treatment facilities only.</b> Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                                                                                              |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | thiamethoxam + metalaxyl-M + fludioxonil + sedaxane | Cruiser Maxx Beans + Vibrance 500 FS (sold as a co-pack: Cruiser Maxx Vibrance Beans) | 195 mL + 5–10 mL/ 100 kg seed (2.5–5 g ai/ 100 kg seed) | N/A | <b>For use in commercial seed treatment facilities only.</b> Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers for details prior to use. Use the low rate of Vibrance 500 FS (2.5 g ai/100 kg) for control of pre-emergent damping-off, seed decay or seedling blight. For extended control of post-emergent damping-off and seedling blight or high disease pressure, use the high rate (5 g ai/100 kg). Follow resistance management instructions on the label. |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | trifloxystrobin                                     | Trilex FS                                                                             | 21 mL/ 100 kg seed                                      | N/A | <b>For use in commercial seed treatment facilities only.</b> Apply using standard commercial seed treatment equipment. Not for use in hopper-box, planter-box, slurry-box or similar seed treatment applications. Uniform application on seed is necessary to ensure seed safety and best disease protection.                                                                                                                                                                                          |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | penflufen + prothioconazole + metalaxyl             | EverGol Energy                                                                        | 65 mL/ 100 kg seed                                      | N/A | For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions. For control of early-season phytophthora in soybean, product may be tank-mixed with metalaxyl and metalaxyl-M but, again, see tank-mix partner label.                                               |  |

## SOYBEAN DISEASES

**Table 2–8.** Chemical Control Options for Diseases in Soybeans — Phomopsis Seed Mould**LEGEND:** PHI = Pre-Harvest Interval (in days)

N/A = not applicable

| Integrated Pest Management Options                                                                                                                                                                                         | Active Ingredient                    | Trade Name   | Rate                       | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|--------------|----------------------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>PHOMOPSIS SEED MOULD (<i>Phomopsis longicolla</i>) (cont'd)</b>                                                                                                                                                         |                                      |              |                            |     |                                                                                                                                                                                                                                                  |
| <b>Foliar Treatment</b>                                                                                                                                                                                                    |                                      |              |                            |     |                                                                                                                                                                                                                                                  |
| Symptoms appear mid-season as rows of small, black, raised dots or bumps on the stem and later on the pods. Management includes the use of full season varieties, crop rotation, fungicides and removal of soybean debris. | trifloxystrobin<br>+ prothioconazole | Stratego Pro | 572 mL/ha<br>(230 mL/acre) | 20  | Ground and aerial application. Begin fungicide applications preventively or at the first signs of disease from early flowering (R1) to complete pod fill (R5). A non-ionic surfactant at 0.125% vol/vol may be used with Stratego Pro fungicide. |

## SOYBEAN DISEASES

Table 2–9. Chemical Control Options for Diseases in Soybeans — Rhizoctonia Damping-Off

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                              | Active Ingredient                                            | Trade Name                                                                                           | Rate                                                                                          | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>RHIZOCTONIA DAMPING-OFF (<i>Rhizoctonia solani</i>)</b>                                                                                                                                                                                                                                                                                      |                                                              |                                                                                                      |                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                                           |                                                              |                                                                                                      |                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| This disease can occur on all soil types and environmental conditions. Losses due to this disease are greatest when a dry spring is followed by wet conditions. Few management options exist since no resistant or tolerant varieties are available. Seed treatment and crop rotation with corn and small grains can help minimize the disease. | fludioxonil                                                  | Maxim 480 FS                                                                                         | 5.2–10.4 mL/<br>100 kg seed                                                                   | <b>For use in commercial seed treatment facilities only.</b> Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at or immediately before planting. Do not graze treated crops or cut for forage within 30 days of planting.                                                                                                                                                                                                                                                                                                                                                                                              |
|                                                                                                                                                                                                                                                                                                                                                 | fludioxonil<br>+ metalaxyl-M                                 | Apron Maxx RTA                                                                                       | 325 mL/<br>100 kg seed                                                                        | For both commercial seed treatment plants and on-farm treatment using standard gravity- or mist-type seed treatment equipment. Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers prior to use. Ensure uniform coverage.                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                 |                                                              | Apron Maxx RFC                                                                                       | 100 mL<br>+ 230 mL of water/<br>100 kg seed                                                   | For commercial and on-farm treating. Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                 | saponins of<br><i>Chenopodium quinoa</i>                     | Heads Up Plant<br>Protectant                                                                         | 1 g/1 L of water/<br>100 kg seed<br><br>Apply 1 L solution<br>for every 163 kg of<br>soybean. | <b>Treat only healthy, vigorous seed. Treat only seed needed for immediate use and planting. Thoroughly coat the surface of the seed with dissolved solution.</b> Soybean seeds must be prepared and ready for seeding. The object is to achieve a wet shiny appearance to the seed. This will dry off or be absorbed by the seed, however, the treatment will remain in effect. Treat the seeds by dipping, spraying or dribbling the solution into a rotating auger conveyor or some other seed treatment device. Spray applications to seeds within an enclosed spray booth or other enclosed spray device are also acceptable, providing thorough coverage is achieved. |
|                                                                                                                                                                                                                                                                                                                                                 | thiamethoxam<br>+ metalaxyl-M<br>+ fludioxonil               | Cruiser Maxx Beans                                                                                   | 195 mL/<br>100 kg seed                                                                        | <b>For use in commercial seed treatment facilities only.</b> Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                 | thiamethoxam<br>+ metalaxyl-M<br>+ fludioxonil<br>+ sedaxane | Cruiser Maxx Beans<br>+<br>Vibrance 500 FS<br>(sold as a co-pack:<br>Cruiser Maxx<br>Vibrance Beans) | 195 mL<br>+<br>5–10 mL/<br>100 kg seed<br>(2.5–5 g ai/<br>100 kg seed)                        | <b>For use in commercial seed treatment facilities only.</b> Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers for details prior to use. Use the low rate of Vibrance 500 FS (2.5 g ai/100 kg) for control of pre-emergent damping-off, seed decay or seedling blight. For extended control of post-emergent damping-off and seedling blight or high disease pressure, use the high rate (5 g ai/100 kg). Follow resistance management instructions as stated on the label.                                                                                                                                                            |
|                                                                                                                                                                                                                                                                                                                                                 | carbathiin<br>+ thiram                                       | Anchor                                                                                               | 600 mL/<br>100 kg seed                                                                        | <b>For drill box application.</b> Ensure uniform coverage on seed. Do not apply Anchor through commercial seed-treating equipment or through an auger, as excessive seed wetness may result. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                                                 |                                                              | Vitaflo 280                                                                                          | 260 mL/<br>100 kg seed                                                                        | <b>For use in commercial seed treatment facilities only.</b> Do not store treated soybean seed. May be applied through commercial seed treatment equipment or auger. Ensure uniform coverage.                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                                                                                                                                                                                                                                                                                                                 | penflufen<br>+ prothioconazole<br>+ metalaxyl                | EverGol Energy                                                                                       | 65 mL/<br>100 kg seed                                                                         | For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions. For control of early-season phytophthora in soybean, product may be tank-mixed with metalaxyl and metalaxyl-M but, again, see tank-mix partner label.                                                                                                                                                                                                                    |

## SOYBEAN DISEASES

Table 2–10. Chemical Control Options for Diseases in Soybeans — Pythium Damping-Off

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Active Ingredient                                   | Trade Name                                                                                        | Rate                                                                   | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------|---------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SEED ROT/PREEMERGENCE DAMPING-OFF (<i>Pythium</i> spp.)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                     |                                                                                                   |                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                     |                                                                                                   |                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <p>This disease can occur on all soil types but crop losses are greatest in cold, wet, clay soils. Try to minimize soil compaction and remove excess moisture through increased drainage. Plant seed when soil temperatures are above 13°C. Treat seed with metalaxyl or metalaxyl-M. There is no known resistance but there is some degree of tolerance available in varieties. Consult with your seed company and the Ontario Soybean and Canola Committee (OSACC) Variety Trial Results at <a href="http://www.gosoy.ca">www.gosoy.ca</a> for variety profiles. Crop rotation has limited effect.</p> | fludioxonil + metalaxyl-M                           | Apron Maxx RTA                                                                                    | 325 mL/<br>100 kg seed                                                 | For both commercial seed treatment plants and on-farm treatment using standard gravity or mist-type seed treatment equipment. Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers prior to use. Ensure uniform coverage.                                                                                                                                                                                                                                                                                                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                     | Apron Maxx RFC                                                                                    | 100 mL<br>+ 230 mL of water/<br>100 kg seed                            | For commercial and on-farm treating. Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                                                                                                                                                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | thiamethoxam + metalaxyl-M + fludioxonil            | Cruiser Maxx Beans                                                                                | 195 mL/<br>100 kg seed                                                 | <b>For use in commercial seed treatment facilities only.</b> Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                                                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | thiamethoxam + metalaxyl-M + fludioxonil + sedaxane | Cruiser Maxx Beans +<br>Vibrance 500 FS<br>(sold as a co-pack:<br>Cruiser Maxx<br>Vibrance Beans) | 195 mL<br>+<br>5–10 mL/<br>100 kg seed<br>(2.5–5 g ai/<br>100 kg seed) | <b>For use in commercial seed treatment facilities only.</b> Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers for details prior to use. Use the low rate of Vibrance 500 FS (2.5 g ai/100 kg) for control of pre-emergent damping-off, seed decay or seedling blight. For extended control of post-emergent damping-off and seedling blight or high disease pressure, use the high rate (5 g ai/100 kg). Follow resistance management recommendations as stated on label.                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | metalaxyl                                           | Allegiance FL                                                                                     | 46–93 mL/<br>100 kg seed                                               | For commercial and on-farm treating. Do not graze or feed livestock on seeded area for 4 weeks after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                     | Apron FL                                                                                          |                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | metalaxyl-M                                         | Apron XL LS                                                                                       | 20–40 mL/<br>100 kg seed                                               | <b>For use in commercial seed treatment facilities only.</b> Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at or immediately before planting. Do not graze or feed livestock on seeded area for 4 weeks after planting. Read label for information regarding resistant strains of fungus.                                                                                                                                                                                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | penflufen + prothioconazole + metalaxyl             | EverGol Energy                                                                                    | 65 mL/<br>100 kg seed                                                  | For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions. For control of early-season phytophthora in soybean, product may be tank-mixed with metalaxyl and metalaxyl-M but see tank-mix partner label.                                                                                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ethaboxam                                           | Intego Solo Fungicide                                                                             | 19.6 mL/<br>100 kg seed                                                | For commercial and on-farm treating. Regulations under the Seeds Act require that an appropriate colourant must be added when this product is applied to seed.<br><br>For best results, use Intego Solo fungicide combined with other oomycete-active seed treatment fungicides, such as metalaxyl, to broaden the spectrum of activity. Intego Solo fungicide can also be used in combination with a broad-spectrum registered seed treatment fungicide having activity against <i>Rhizoctonia solani</i> and other fungal pathogens inciting seed and seedling disease. |

## SOYBEAN DISEASES

Table 2-11. Chemical Control Options for Diseases in Soybeans — Fusarium Seedling Blight

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Active Ingredient                                            | Trade Name                                                                                           | Rate                                                                   | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>FUSARIUM SEEDLING BLIGHT (<i>Fusarium oxysporum</i> or <i>Fusarium solani</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                          |                                                              |                                                                                                      |                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                              |                                                                                                      |                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Cool, wet spring conditions favour infection. Resistant varieties are not available. Minimize soil compaction and remove excess soil moisture through improved drainage. A small amount of tillage will help warm soil and improve surface drainage. Rotate with corn and wheat. Plant high-quality seed when soil temperatures are above 13°C. Fungicide seed treatment recommended. Mounding or ridging soil at the base of the plants produces adventitious roots that can minimize losses. | fludioxonil                                                  | Maxim 480 FS                                                                                         | 5.2–10.4 mL/<br>100 kg seed                                            | <b>For use in commercial seed treatment facilities only.</b> Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at or immediately before planting. Do not graze treated crops or cut for forage within 30 days of planting.                                                                                                                                                                                                                                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | fludioxonil<br>+ metalaxyl-M                                 | Apron Maxx RTA                                                                                       | 325 mL/<br>100 kg seed                                                 | For both commercial seed treatment plants and on-farm treatment using standard gravity- or mist-type seed treatment equipment. Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers prior to use. Ensure uniform coverage.                                                                                                                                                                                                                                                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                              | Apron Maxx RFC                                                                                       | 100 mL<br>+ 230 mL of water/<br>100 kg seed                            | For commercial and on-farm treating. Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers prior to use. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                                                                                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | thiamethoxam<br>+ metalaxyl-M<br>+ fludioxonil               | Cruiser Maxx Beans                                                                                   | 195 mL/<br>100 kg seed                                                 | <b>For use in commercial seed treatment facilities only.</b> Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | thiamethoxam<br>+ metalaxyl-M<br>+ fludioxonil<br>+ sedaxane | Cruiser Maxx Beans<br>+<br>Vibrance 500 FS<br>(sold as a co-pack:<br>Cruiser Maxx<br>Vibrance Beans) | 195 mL<br>+<br>5–10 mL/<br>100 kg seed<br>(2.5–5 g ai/<br>100 kg seed) | <b>For use in commercial seed treatment facilities only.</b> Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers for details prior to use. Use the low rate of Vibrance 500 FS (2.5 g ai/100 kg seed) for control of pre-emergent damping-off, seed decay or seedling blight. For extended control of post-emergent damping-off and seedling blight or high disease pressure, use the high rate (5 g ai/100 kg seed). Follow resistance management instructions as stated on the label. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | carbathiin<br>+ thiram                                       | Anchor                                                                                               | 600 mL/<br>100 kg seed                                                 | <b>For drill box application.</b> Ensure uniform coverage on seed. Do not apply Anchor through commercial seed-treating equipment or through an auger, as excessive seed wetness may result. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                              | Vitaflo 280                                                                                          | 260 mL/<br>100 kg seed                                                 | <b>For commercial seed treating facilities only.</b> Do not store treated soybean seed. May be applied through commercial seed-treatment equipment or auger. Ensure uniform coverage.                                                                                                                                                                                                                                                                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | penflufen<br>+ prothioconazole<br>+ metalaxyl                | EverGol Energy                                                                                       | 65 mL/<br>100 kg seed                                                  | For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions. For control of early-season phytophthora in soybean, product may be tank-mixed with metalaxyl and metalaxyl-M but see tank-mix partner label.                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | captan                                                       | Agrox FL                                                                                             | 280 mL/<br>100 kg seed                                                 | <b>For commercial seed treatment facilities only.</b> Mix with the amount of water required for the slurry treater equipment to be used.                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | trifloxystrobin                                              | Trilex FS                                                                                            | 21 mL/<br>100 kg seed                                                  | <b>For use in commercial seed treatment facilities only.</b> Apply using standard commercial seed treatment equipment. Not for use in hopper-box, planter-box, slurry-box or similar seed treatment applications. Uniform application on seed is necessary to ensure seed safety and best disease protection.                                                                                                                                                                                                              |

## SOYBEAN DISEASES

Table 2–12. Chemical Control Options for Diseases in Soybeans — White Mould

| LEGEND: PHI = Pre-Harvest Interval (in days)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                      |              | N/A = not applicable                                                                                            |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|--------------|-----------------------------------------------------------------------------------------------------------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Active Ingredient                    | Trade Name   | Rate                                                                                                            | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |
| WHITE MOULD ( <i>Sclerotinia sclerotiorum</i> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                      |              |                                                                                                                 |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |
| Foliar Treatment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                      |              |                                                                                                                 |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |
| White mould is a sporadic disease that thrives under cool, wet conditions during flowering or near harvest. Fields at risk have a history of white mould, good leaf growth, high plant populations and more than 48 hr of continuous wetness and air temperatures between 15°C and 20°C (day and night average temperatures).<br><br>In fields with a history of white mould, use non-host crops and avoid growing other host crops such as canola, edible beans, buckwheat and sunflowers for 2–3 yr. Plant a tolerant variety, although none are resistant (immune), select a variety with good lodging resistance and keep sclerotia on the surface through conservation tillage practices. Consult with your seed company and the Ontario Soybean and Canola Committee (OSACC) Variety Trial Results at <a href="http://www.gosoy.ca">www.gosoy.ca</a> for variety profiles. | <i>Coniothyrium minitans</i>         | Contans WG   | 0.5–4 kg/ha<br>(0.20–1.6 kg/acre)                                                                               | 0   | <b>Provides suppression only. Ground application only.</b> Good option for organically grown soybeans. This product should be applied at least 3 months prior to anticipated outbreak (e.g., prior to planting). Product should be incorporated as thoroughly as possible to a depth of 5–20 cm. Rate should be increased to 2–4 kg/ha (0.8–1.6 kg/acre) if incorporated to a depth greater than 5 cm. A post-harvest application may be applied in the fall to treat the soil prior to spring planting of a susceptible crop. Treated soils in the fall should not be disturbed to avoid bringing untreated sclerotia from lower soil layers to the top soil layer. Maximum 2 applications/yr. |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <i>Bacillus subtilis</i>             | Serenade ASO | 4.0–15.0 L/ha<br>(1.6–6.0 L/acre)                                                                               | 0   | <b>Provides suppression only.</b> Ground and aerial application. Good option for organically grown soybeans. Under conditions of moderate-to-high disease pressure, use the higher rate and shorter application intervals. For maximum effectiveness, apply prior to, or at the early stages of disease development. Apply in sufficient water volume to ensure full coverage for effective control. Repeat as necessary on a 7–10-day interval.                                                                                                                                                                                                                                                |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | pyraclostrobin<br>+ fluxapyroxad     | Priaxor      | 0.45 L/ha<br>(180 mL/acre)                                                                                      | 21  | <b>Provides suppression only.</b> Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Use high rate for suppression of sclerotinia stem rot. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                          |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | fluazinam                            | Allegro 500F | <b>Suppression:</b><br>0.44 L/ha<br>(178 mL/acre)<br><br><b>Control:</b><br>0.88–1.17 L/ha<br>(356–475 mL/acre) | 30  | <b>Ground application only.</b> Begin applications at the R1–R2 stage of development, and repeat again 10–14 days later if conditions favour disease development. Use spray volumes of 200–600 L/ha, depending on amount of plant growth. Maximum amount of 2.34 L/ha during the year. Maximum 2 applications/yr. Do not apply after R3 stage. 24-hr re-entry period.<br><br><b>DO NOT</b> allow livestock to graze treated areas. <b>DO NOT</b> feed hay from treated fields to livestock.                                                                                                                                                                                                     |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | picoxystrobin                        | Acapela      | 0.44–0.88 L/ha<br>(180–350 mL/acre)                                                                             | 14  | Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Optimal timing is typically R2–R3 growth stage. Use high rate and shorter interval when disease pressure is high. Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha/season. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                         |  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | trifloxystrobin<br>+ prothioconazole | Stratego Pro | 572 mL/ha<br>(230 mL/acre)                                                                                      | 20  | Ground and aerial application. Begin fungicide applications preventively or at the first signs of disease from early flowering (R1) to complete pod fill (R5). A non-ionic surfactant at 0.125% vol/vol may be used with Stratego Pro fungicide.                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |

## SOYBEAN DISEASES

**Table 2-12.** Chemical Control Options for Diseases in Soybeans — White Mould

| <b>LEGEND:</b> PHI = Pre-Harvest Interval (in days)           |                                       | N/A = not applicable      |                                                                        |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|---------------------------------------------------------------|---------------------------------------|---------------------------|------------------------------------------------------------------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Integrated Pest Management Options                            | Active Ingredient                     | Trade Name                | Rate                                                                   | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>WHITE MOULD (<i>Sclerotinia sclerotiorum</i>) (cont'd)</b> |                                       |                           |                                                                        |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Seed Treatment</b>                                         |                                       |                           |                                                                        |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| See foliar treatment section above.                           | saponins of <i>Chenopodium quinoa</i> | Heads Up Plant Protectant | 1 g/1 L of water/ha<br>Apply 1 L solution for every 163 kg of soybean. | N/A | <b>Provides suppression only. Treat only healthy vigorous seed. Treat only seed needed for immediate use and planting.</b> Thoroughly coat the surface of the seed with dissolved solution. Soybean seeds must be prepared and ready for seeding. The object is to achieve a wet shiny appearance to the seed. This will dry off or be absorbed by the seed, however, the treatment will remain in effect. Treat the seeds by dipping, spraying or dribbling the solution into a rotating auger conveyor or some other seed treatment device. Spray applications to seeds within an enclosed spray booth or other enclosed spray device are also acceptable, providing thorough coverage is achieved. |

## SOYBEAN DISEASES

**Table 2–13.** Chemical Control Options for Diseases in Soybeans — Powdery Mildew**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                       | Active Ingredient               | Trade Name     | Rate                               | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|----------------|------------------------------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>POWDERY MILDEW (<i>Microsphaera diffusa</i>)</b>                                                                                                                                                                                                                                                                                                                                                      |                                 |                |                                    |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Foliar Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                  |                                 |                |                                    |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| This disease is most noticeable when conditions are wet or humid. Powdery mildew develops on the leaves, usually in August and September. Outbreaks arise when disease symptoms begin in early July and the environmental conditions remain cool, cloudy and humid through to pod fill. Removal of crop residue and rotation with non-host crops, such as corn and wheat, will help reduce disease risk. | tebuconazole                    | Folicur 250 EW | 375–500 mL/ha<br>(152–200 mL/acre) | 20  | Ground and aerial application. Apply when first symptoms of disease can be found or when risk of infection is imminent. Use the higher rate when disease pressure is severe. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. The use of a non-ionic surfactant (Agral 90 or Agsurf) is <b>NOT</b> required, as it is built into the formulation. Maximum 1 application/yr. 12-hr re-entry period. |
|                                                                                                                                                                                                                                                                                                                                                                                                          |                                 | Folicur 432 F  | 220–292 mL/ha<br>(90–118 mL/acre)  | 20  | Ground and aerial application. Apply when first symptoms of disease can be found or when risk of infection is imminent. Use the higher rate when disease pressure is severe. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Always use a non-ionic surfactant such as Agral 90 or Agsurf at 0.125% vol/vol. Maximum 1 application/yr. 12-hr re-entry period.                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                          | propiconazole                   | Tilt 250 E     | 500 mL/ha<br>(200 mL/acre)         | 30  | Ground and aerial application. First application should be made at the first sign of disease, followed by a second application 14 days after the first application, if environmental conditions are favourable for disease development. Good spray coverage and canopy penetration are important for best results. See label for resistance management strategy. Maximum 2 applications/yr.                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                          | azoxystrobin                    | Quadris        | 500 mL/ha<br>(200 mL/acre)         | 15  | Ground and aerial application. See label for resistance management strategy. Maximum 2 applications/yr. Re-entry possible once residues have dried.                                                                                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                          | azoxystrobin<br>+ propiconazole | Quilt          | 1.0 L/ha<br>(400 mL/acre)          | 30  | Ground and aerial application. First application should be made at the first sign of disease, followed by a second application 14 days after the first application, if environmental conditions are favourable for disease development. Good spray coverage and canopy penetration are important for best results. See label for resistance management strategy. Maximum 2 applications/yr.                                                           |

## SOYBEAN DISEASES

Table 2–14. Chemical Control Options for Diseases in Soybeans — Asian Soybean Rust

LEGEND: PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Active Ingredient             | Trade Name     | Rate                               | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|----------------|------------------------------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>ASIAN SOYBEAN RUST (<i>Phakopsora pachyrhizi</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                               |                |                                    |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Foliar Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                               |                |                                    |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <p>Asian soybean rust is an invasive fungal disease. Scouting and early detection are critical to managing this disease. The early stages of the disease can be confused with other common foliar diseases such as septoria brown spot, bacterial pustule, downy mildew, frog-eye leaf spot and bacterial blight.</p> <p>Numerous factors such as crop stage (R1–R6), yield potential, disease risk or presence are critical components of the fungicide decision process. Strobilurin fungicides such as Headline or Quadris are protective products that stop spore germination and penetration into the soybean leaf. The strobilurins have no effect on the fungus once inside the leaf. Since the strobilurin group of fungicides have no curative activity, do not make solo applications of a strobilurin if any rust is present. The triazole fungicides such as Tilt and Folicur have varying protective abilities and are usually considered “early post-infection” fungicides. The post-infection or curative abilities are limited, and the fungicides may not perform well if 5%–10% disease is present in the lower crop canopy. Combination products containing both a strobilurin and triazole fungicide such as Quilt have preventive (pre-infection) and curative (post-infection) properties.</p> <p>Long periods of leaf wetness are needed for spore germination, as well as temperatures between 15°C and 30°C and a high relative humidity. Yield loss is very likely once rust can be found in the mid-crop canopy. For these reasons, scouting, fungicide selection, timing and application are critical to successful management of soybean rust.</p> <p>For further information on scouting techniques, sentinel plots, thresholds, management options and emergency use registrations, see OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i>, as well as the Grain Farmers of Ontario website at <a href="http://www.gfo.ca">www.gfo.ca</a>.</p> | pyraclostrobin                | Headline EC    | 400–600 mL/ha<br>(160–240 mL/acre) | 21  | Ground and aerial application. Classified as a strobilurin fungicide; use this product in a preventive fungicide program (pre-infection). See label for resistance management strategy. Maximum 2 applications/yr.                                                                                                                                                                                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | azoxystrobin                  | Quadris        | 500 mL/ha<br>(200 mL/acre)         | 15  | Ground and aerial application. Classified as a strobilurin fungicide; use this product in a preventive fungicide program (pre-infection). See label for resistance management strategy. Maximum 2 applications/yr. Re-entry possible once residues have dried.                                                                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | propiconazole                 | Tilt 250 E     | 500–750 mL/ha<br>(200–300 mL/acre) | 30  | Ground and aerial application. First application should be made at the first sign of disease, followed by a second application 14 days after the first application, if environmental conditions are favourable for disease development. Good spray coverage and canopy penetration are important for best results. See label for resistance management strategy. Maximum 2 applications/yr.                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | azoxystrobin + propiconazole  | Quilt          | 1.0–1.5 L/ha<br>(400–600 mL/acre)  | 30  | Ground and aerial application. First application should be made at the first sign of disease, followed by a second application 14 days after the first application, if environmental conditions are favourable for disease development. Good spray coverage and canopy penetration are important for best results. See label for resistance management strategy. Maximum 2 applications/yr.                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | prothioconazole               | Proline 480 SC | 210 mL/ha<br>(85 mL/acre)          | 20  | Ground and aerial application. Apply when first symptoms of disease can be found or the risk of infection is imminent. Maximum 1 application/yr. 24-hr re-entry period.                                                                                                                                                                                                                                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | tebuconazole                  | Folicur 250 EW | 375–500 mL/ha<br>(152–200 mL/acre) | 20  | Ground and aerial application. Apply when first symptoms of disease can be found or when risk of infection is imminent. Use the higher rate when disease pressure is severe. Use a minimum of 100 L of water for ground application, 47 L of water for aerial application. The use of a non-ionic surfactant (Agral 90 or Agsurf) is <b>NOT</b> required, as it is built into the formulation. Maximum 1 application/yr. 12-hr re-entry period. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                               | Folicur 432 F  | 220–292 mL/ha<br>(90–118 mL/acre)  | 20  | Ground and aerial application. Apply when first symptoms of disease can be found or when risk of infection is imminent. Use the higher rate when disease pressure is severe. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Always use a non-ionic surfactant such as Agral 90 or Agsurf at 0.125% vol/vol. Maximum 1 application/yr. 12-hr re-entry period.                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | pyraclostrobin + fluxapyroxad | Priaxor        | 0.3–0.45 L/ha<br>(120–180 mL/acre) | 21  | Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                   |

## SOYBEAN DISEASES

**Table 2–14.** Chemical Control Options for Diseases in Soybeans — Asian Soybean Rust

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                | Active Ingredient                  | Trade Name      | Rate                                  | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------------------------------------|------------------------------------|-----------------|---------------------------------------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>ASIAN SOYBEAN RUST (<i>Phakopsora pachyrhizi</i>) (cont'd)</b> |                                    |                 |                                       |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Foliar Treatment (cont'd)</b>                                  |                                    |                 |                                       |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| (cont'd)                                                          | trifloxystrobin<br>+ propiconazole | Stratego 250 EC | 500 mL/ha<br>(200 mL/acre)            | 20  | Ground and aerial application. Begin applications preventively from early flowering (R1) to complete pod fill (R5) when risk of rust infection is high. Use 100–200 L/ha of water for ground application, 50 L/ha for aerial application. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                           |
|                                                                   |                                    | Stratego Pro    | 572 mL/ha<br>(230 mL/acre)            | 20  | Ground and aerial application. Begin fungicide applications preventively or at the first signs of disease from early flowering (R1) to complete pod fill (R5). A non-ionic surfactant at 0.125% vol/vol may be used with Stratego Pro fungicide.                                                                                                                                                                                                                                                                                                                                      |
|                                                                   | picoxystrobin                      | Acapela         | 0.44–0.88 L/ha<br>(180–350 mL/acre)   | 14  | Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Optimal timing is typically R2–R3 growth stage. Use high rate and shorter interval when disease pressure is high. Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha/season. 12-hr re-entry period.                                                                                                                                                                                               |
|                                                                   | penthiopyrad                       | Vertisan        | 1–1.75 L/ha<br>(400–700 mL/acre)      | 14  | Ground and aerial application. Begin applications prior to disease development and continue on a 7–14-day interval. Use higher rate and shorter interval when disease pressure is high. Do not apply more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 3 L/ha/yr. 12-hr re-entry period.                                                                                                                                                                                                                                   |
|                                                                   | flutriafol                         | Fullback 125 SC | 0.512–1.024 L/ha<br>(207–414 mL/acre) | 21  | <b>Ground application only.</b> Apply as a broadcast foliar spray when conditions are favourable for development of soybean rust. Repeat 21–35 days after first application if environmental conditions are favourable for continued disease development. Do not apply more than 2,048 mL/ha per season. Do not apply more than 3 applications per growing season. No single application may exceed 1,024 mL/ha; only 1 application at 1,024 mL/ha may be made to any one field during a single growing season. 12-hr re-entry period. Apply only to soybeans harvested for dry seed. |

## SOYBEAN DISEASES

**Table 2–15.** Chemical Control Options for Diseases in Soybeans — Frogeye Leaf Spot**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                                                                     | Active Ingredient                  | Trade Name      | Rate                               | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-----------------|------------------------------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>FROGEYE LEAF SPOT (<i>Cercospora sojina</i>)</b>                                                                                                                                                                                                                    |                                    |                 |                                    |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Foliar Treatment</b>                                                                                                                                                                                                                                                |                                    |                 |                                    |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| The economic impact of this disease is minimal. Frogeye leaf spot occurs under hot, humid conditions particularly on very susceptible varieties. Consult with your seed company for variety profiles. This disease is most frequent in the extreme southwest counties. | pyraclostrobin                     | Headline EC     | 400–600 mL/ha<br>(160–240 mL/acre) | 21  | Ground and aerial application. First application should be applied at the first sign of disease, followed by the second application 14 days after, if environmental conditions are favourable for disease development. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                              |
|                                                                                                                                                                                                                                                                        | trifloxystrobin<br>+ propiconazole | Stratego 250 EC | 500 mL/ha<br>(200 mL/acre)         | 20  | Ground and aerial application. Spray between R3 and R4 (early pod fill) or when first symptoms appear. Use 100–200 L/ha of water for ground application, 50 L/ha for aerial application. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                            |
|                                                                                                                                                                                                                                                                        | tebuconazole                       | Folicur 250 EW  | 375–500 mL/ha<br>(152–200 mL/acre) | 20  | Ground and aerial application. Apply when first symptoms of disease can be found or when risk of infection is imminent. Use the higher rate when disease pressure is severe. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. The use of a non-ionic surfactant (Agral 90 or Agsurf) is <b>NOT</b> required, as it is built into the formulation. Maximum 1 application/yr. 12-hr re-entry period. |
|                                                                                                                                                                                                                                                                        |                                    | Folicur 432 F   | 220–292 mL/ha<br>(90–118 mL/acre)  | 20  | Ground and aerial application. Apply when first symptoms of disease can be found or when risk of infection is imminent. Use the higher rate when disease pressure is severe. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Always use a non-ionic surfactant such as Agral 90 or Agsurf at 0.125% vol/vol. Maximum 1 application/yr. 12-hr re-entry period.                                     |
|                                                                                                                                                                                                                                                                        | pyraclostrobin<br>+ fluxapyroxad   | Priaxor         | 300 mL/ha<br>(120 mL/acre)         | 21  | Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Use high rate for suppression of sclerotinia stem rot. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                  |
|                                                                                                                                                                                                                                                                        | prothioconazole                    | Proline 480 SC  | 210 mL/ha<br>(85 mL/acre)          | 20  | Ground and aerial application. Apply when first symptoms of disease can be found or the risk of infection is imminent. Maximum 1 application/yr. 24-hr re-entry period.                                                                                                                                                                                                                                                                               |
|                                                                                                                                                                                                                                                                        | propiconazole                      | Bumper 418 EC   | 300–455 mL/ha<br>(121–184 mL/acre) | 50  | <b>For use on soybeans grown for seed only. Ground application only.</b> Apply when disease first appears. Under severe disease pressure, make a second application 14 days after. Harvested soybean seed should not be used for human food or animal feed.                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                        |                                    | Tilt 250 E      | 500–760 mL/ha<br>(200–308 mL/acre) | 30  | <b>Ground application only.</b> Apply when disease symptoms first appear. Under severe disease pressure, make a second application 14 days after. Harvested soybean seed should not be used for human food or animal feed.                                                                                                                                                                                                                            |

## SOYBEAN DISEASES

**Table 2–15.** Chemical Control Options for Diseases in Soybeans — Frogeye Leaf Spot

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                           | Active Ingredient                    | Trade Name      | Rate                                  | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------------------------------------------------|--------------------------------------|-----------------|---------------------------------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>FROGEYE LEAF SPOT (<i>Cercospora sojina</i>) (cont'd)</b> |                                      |                 |                                       |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Foliar Treatment (cont'd)</b>                             |                                      |                 |                                       |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| (cont'd)                                                     | <i>Bacillus subtilis</i>             | Serenade ASO    | 1.0–4.0 L/ha<br>(0.4–1.6 L/acre)      | 0   | <b>Provides suppression only.</b> Ground and aerial application. Good option for organically grown soybeans. Under conditions of moderate-to-high disease pressure, use the higher rate and shorter application intervals. For maximum effectiveness, apply prior to, or at the early stages of disease development. Apply in sufficient water volume to ensure full coverage for effective control. Repeat as necessary on a 7–10-day interval.                                                                                                                                           |
|                                                              | trifloxystrobin<br>+ prothioconazole | Stratego Pro    | 572 mL/ha<br>(230 mL/acre)            | 20  | Ground and aerial application. Begin fungicide applications preventively or at the first signs of disease from early flowering (R1) to complete pod fill (R5). A non-ionic surfactant at 0.125% vol/vol may be used with Stratego Pro fungicide.                                                                                                                                                                                                                                                                                                                                           |
|                                                              | azoxystrobin<br>+ propiconazole      | Quilt           | 1.0–1.5 L/ha<br>(400–600 mL/acre)     | 30  | Susceptible varieties are most prone to the disease. Scout for disease and make the first application at growth stage R3 (early pod set) and 14 days later, at approximately growth stage R5, if needed.                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                              | picoxystrobin                        | Acapela         | 0.44–0.88 L/ha<br>(0.18–0.35 L/acre)  | 14  | Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Optimal timing is typically R2–R3 growth stage. Use high rate and shorter interval when disease pressure is high. Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha/season. 12-hr re-entry period.                                                                                                                                                                                                    |
|                                                              | penthiopyrad                         | Vertisan        | 1–1.75 L/ha<br>(400–700 mL/acre)      | 14  | Ground and aerial application. Begin applications prior to disease development and continue on a 7–14-day interval. Use higher rate and shorter interval when disease pressure is high. Do not apply more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 3 L/ha/yr. 12-hr re-entry period.                                                                                                                                                                                                                                        |
|                                                              | flutriafol                           | Fullback 125 SC | 0.512–1.024 L/ha<br>(207–414 mL/acre) | 21  | <b>Ground application only.</b> Apply as a broadcast foliar spray when conditions are favourable for development of frogeye leaf spot. Repeat 14–21 days after first application if environmental conditions are favourable for continued disease development. Do not apply more than 2,048 mL/ha per season. Do not apply more than 3 applications per growing season. No single application may exceed 1,024 mL/ha; only 1 application at 1,024 mL/ha may be made to any one field during a single growing season. 12-hr re-entry period. Apply only to soybeans harvested for dry seed. |

## SOYBEAN DISEASES

**Table 2-16.** Chemical Control Options for Diseases in Soybeans — Septoria Brown Spot**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Active Ingredient                 | Trade Name      | Rate                                  | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-----------------|---------------------------------------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SEPTORIA BROWN SPOT</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                   |                 |                                       |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Foliar Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                 |                                       |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| The disease is common but, in most cases, of minor economic importance unless disease development begins early in the season, which can lead to significant defoliation on very susceptible varieties. Varieties differ in susceptibility so if you have multiple varieties, make note of the differences in their response to the disease. Symptoms may be difficult to distinguish from those of bacterial blight, soybean rust and downy mildew. A good rotation with non-host crops such as wheat and corn will lower disease levels. For more information, see OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , for more information. | pyraclostrobin + fluxapyroxad     | Priaxor         | 0.3 L/ha<br>(120 mL/acre)             | 21  | Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Use high rate for suppression of sclerotinia stem rot. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | picoxystrobin                     | Acapela         | 0.44–0.88 L/ha<br>(0.18–0.35 L/acre)  | 14  | Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Optimal timing is typically R2–R3 growth stage. Use high rate and shorter interval when disease pressure is high. Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha/season. 12-hr re-entry period.                                                                                                                                                                                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | penthiopyrad                      | Vertisan        | 1–1.75 L/ha<br>(400–700 mL/acre)      | 14  | Ground and aerial application. Begin applications prior to disease development and continue on a 7–14-day interval. Use higher rate and shorter interval when disease pressure is high. Do not apply more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 3 L/ha/yr. 12-hr re-entry period.                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | trifloxystrobin + prothioconazole | Stratego Pro    | 572 mL/ha<br>(230 mL/acre)            | 20  | Ground and aerial application. Begin fungicide applications preventively or at the first signs of disease from early flowering (R1) to complete pod fill (R5). A non-ionic surfactant at 0.125% vol/vol may be used with Stratego Pro fungicide.                                                                                                                                                                                                                                                                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | flutriafol                        | Fullback 125 SC | 0.512–1.024 L/ha<br>(207–414 mL/acre) | 21  | <b>Ground application only.</b> Apply as a broadcast foliar spray when conditions are favourable for development of soybean rust. Repeat 14–21 days after first application if environmental conditions are favourable for continued disease development. Do not apply more than 2,048 mL/ha per season. Do not apply more than 3 applications per growing season. No single application may exceed 1,024 mL/ha; only 1 application at 1,024 mL/ha may be made to any one field during a single growing season. 12-hr re-entry period. Apply only to soybeans harvested for dry seed. |

## SOYBEAN DISEASES

**Table 2–17.** Chemical Control Options for Diseases in Soybeans — Charcoal Rot, Cercospora Blight and Leaf Spot

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Active Ingredient                 | Trade Name      | Rate                                  | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-----------------|---------------------------------------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CHARCOAL ROT (<i>Macrophomina phaseolina</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                   |                 |                                       |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Foliar Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                 |                                       |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| The disease is common but, in most cases, of minor economic importance unless disease development begins early in the season, which can lead to significant defoliation on very susceptible varieties. Varieties differ in susceptibility so if you have multiply varieties, make note of the differences in their response to the disease. Symptoms may be difficult to distinguish from those of bacterial blight, soybean rust and downy mildew. A good rotation with non-host crops such as wheat and corn will lower disease levels. For more information, see OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , for more information. | trifloxystrobin + prothioconazole | Stratego Pro    | 572 mL/ha<br>(230 mL/acre)            | 20  | Ground and aerial application. Begin fungicide applications preventively or at the first signs of disease from early flowering (R1) to complete pod fill (R5). A non-ionic surfactant at 0.125% vol/vol may be used with Stratego Pro fungicide.                                                                                                                                                                                                                                                                                                                                      |
| <b>CERCOSPORA BLIGHT and LEAF SPOT (<i>Cercospora kikuchii</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                   |                 |                                       |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Foliar Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                   |                 |                                       |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| This disease often appears late in the season and can cause leaf blighting and staining of the seed. Yield losses are often minimal, but a reduction in seed quality can occur due to staining. Management includes using clean seed and a fungicide seed treatment. Crop rotation and removal of crop residues can reduce infection potential.                                                                                                                                                                                                                                                                                                           | flutriafol                        | Fullback 125 SC | 0.512–1.024 L/ha<br>(207–414 mL/acre) | 21  | <b>Ground application only.</b> Apply as a broadcast foliar spray when conditions are favourable for development of soybean rust. Repeat 14–21 days after first application if environmental conditions are favourable for continued disease development. Do not apply more than 2,048 mL/ha per season. Do not apply more than 3 applications per growing season. No single application may exceed 1,024 mL/ha; only 1 application at 1,024 mL/ha may be made to any one field during a single growing season. 12-hr re-entry period. Apply only to soybeans harvested for dry seed. |

### 3. Forages

#### FORAGE CROP INSECTS

**Table 3–1.** Chemical Control Options for Insects in Forage Crops — Alfalfa Snout Beetle, Alfalfa Weevil

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Active Ingredient   | Trade Name      | Rate                               | PHI                         | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-----------------|------------------------------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>ALFALFA SNOOT BEETLE (<i>Otiorhynchus ligustici</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                     |                 |                                    |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| No chemical control options available. See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , for management information.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                     |                 |                                    |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>ALFALFA WEEVIL (<i>Hypera postica</i> Gyll)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                     |                 |                                    |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Foliar Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                     |                 |                                    |                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <p><b>First cut:</b> If there is 40% leaf-tip feeding, with 2 or 3 active weevils per stem, and there are more than 7–10 days to preferred harvest date, consider applying an insecticide. (“Leaf-tip feeding” refers to the percent of plant tips showing obvious signs of damage, which is not to be confused with the percent defoliation.)</p> <p>Less than 1 active larva per stem does not require action, but continue to monitor the situation.</p> <p>Two larvae per stem requires action if the alfalfa is less than 40 cm high.</p> <p>If there are more than 3 active larvae, immediate action is required.</p> <p><b>Second Cut:</b> If damage was serious on first cut, feeding may continue. Check early regrowth carefully for damage and larvae.</p> <p>Natural enemies are generally highly effective at controlling this pest. For the safety of these natural enemies, chemical control should not be considered unless pest population exceeds the action threshold. See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i>, for more information.</p> | lambda-cyhalothrin  | Matador 120 E   | 83 mL/ha<br>(34 mL/acre)           | livestock<br>foraging:<br>3 | <p><b>For use in alfalfa only.</b> Ground and aerial application. Allow 7 days between treatments. Alfalfa seed from treated crop is not to be used for production of alfalfa sprouts for human consumption. Maximum 3 applications/yr. Do not apply more than 1 application by air. 24-hr re-entry period.</p> <p>This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.</p> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                     | Silencer 120 EC | 83 mL/ha<br>(34 mL/acre)           | livestock<br>foraging:<br>3 | <p><b>For use in alfalfa only. Ground application only.</b> Allow 7 days between treatments. Alfalfa seed from treated crop is not to be used for production of alfalfa sprouts for human consumption. Maximum 3 applications/yr. 24-hr re-entry period.</p> <p>This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.</p>                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | phosmet             | Imidan 50 WP    | 2.25 kg/ha<br>(900 g/acre)         | 7                           | <p><b>For use in alfalfa only. Ground application only. DO NOT</b> apply during bloom. Maximum 3 applications/yr. Do not apply more than 1 application per cutting. 5-day re-entry period.</p> <p>Toxic to bees. Do not apply to flowering crops or weeds if bees are visiting the treatment area.</p>                                                                                                                                                                                                                                                                                                                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | chlorantraniliprole | Coragen         | 375–500 mL/ha<br>(151–202 mL/acre) | 0                           | <p><b>Provides suppression only. For use in alfalfa only. Ground application only.</b> Begin applications when treatment thresholds have been reached. Thorough coverage is important. Use a minimum of 100 L/ha of water by ground. Maximum 1 application per cutting. 12-hr re-entry period.</p>                                                                                                                                                                                                                                                                                                                                            |

## FORAGE CROP INSECTS

**Table 3–2.** Chemical Control Options for Insects in Forage Crops — Potato Leafhopper, European Skipper, Grasshoppers

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                     | Active Ingredient                  | Trade Name       | Rate                            | PHI                   | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|------------------|---------------------------------|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| POTATO LEAFHOPPER ( <i>Empoasca fabae</i> )                                                                                                                                                                                                                                                                                                                                                                                                                            |                                    |                  |                                 |                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Leafhopper damage is most severe in new seedlings and during regrowth after cutting, particularly when the weather is hot and dry. Resistant varieties have glandular hairs on the leaves and stems. Use chemical control only if leafhoppers exceed the threshold, as insecticides will also kill beneficial insects, the natural enemies of alfalfa weevil and lygus bug.<br><br>See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , for thresholds. | dimethoate                         | Cygon 480 EC     | 425 mL/ha (170 mL/acre)         | 2                     | Ground and aerial application. Maximum 2 applications/yr.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                    | Lagon 480 EC     |                                 |                       | This product is toxic to bees. Restrict application to the period after dark when bees are inside the hives, or in the early morning before the bees are foraging in the fields. <b>DO NOT</b> apply to such crops as alfalfa when in full bloom.                                                                                                                                                                                                                                                                                                                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | lambda-cyhalothrin                 | Matador 120 E    | 83 mL/ha (34 mL/acre)           | livestock foraging: 3 | <b>For use in alfalfa only.</b> Ground and aerial application. Allow 7 days between treatments. Alfalfa seed from treated crop is not to be used for production of alfalfa sprouts for human consumption. Maximum 3 applications/yr. Do not apply more than 1 application by air. 24-hr re-entry period.<br><br>This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                    | Silencer 120 EC  | 83 mL/ha (34 mL/acre)           | livestock foraging: 3 | <b>For use in alfalfa only. Ground application only.</b> Allow 7 days between treatments. Alfalfa seed from treated crop is not to be used for production of alfalfa sprouts for human consumption. Maximum 3 applications/yr. Do not apply more than 1 application by air. 24-hr re-entry period.<br><br>This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.       |
| EUROPEAN SKIPPER ( <i>Thymelicus lineola</i> )                                                                                                                                                                                                                                                                                                                                                                                                                         |                                    |                  |                                 |                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| If 6–8 larvae in a 30-cm-x-30-cm area are found, and larvae are still small, treat the field or the infested area. See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , for scouting procedures.                                                                                                                                                                                                                                                        | <i>Bacillus thuringiensis</i> (Bt) | Dipel 2X DF      | 140–275 g/ha (60–115 g/acre)    | 0                     | <b>For use in timothy only.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                    | Thuricide HPC    | 2.25 L/ha (900 mL/acre)         | 0                     | For use in timothy and other forage grasses.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| GRASSHOPPERS (Various species)                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                    |                  |                                 |                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Begin scouting in late June when grasshoppers are still young. Spraying insecticides on alfalfa will also kill the natural enemies of alfalfa weevil and lygus bugs.                                                                                                                                                                                                                                                                                                   | lambda-cyhalothrin                 | Matador 120 E    | 63–83 mL/ha (26–34 mL/acre)     | livestock foraging: 3 | <b>For use in alfalfa only.</b> Ground and aerial application. Allow 7 days between treatments. Alfalfa seed from treated crop is not to be used for production of alfalfa sprouts for human consumption. Maximum 3 applications/yr. Do not apply more than 1 application by air. 24-hr re-entry period. This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                    | Silencer 120 EC  |                                 |                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | malathion                          | Malathion 500 EC | 2.25–2.75 L/ha (0.9–1.1 L/acre) | 7                     | For use in alfalfa and clover. Apply when 75% of foliage shows feeding damage. Product is less effective when temperatures are below 20°C. Toxic to bees exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flower crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.                                                                                                                                                                                              |

## FORAGE CROP INSECTS

**Table 3–3.** Chemical Control Options for Insects in Forage Crops — Alfalfa Blotch Leafminer, Armyworm

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Active Ingredient   | Trade Name                 | Rate                               | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|----------------------------|------------------------------------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>ALFALFA BLOTCH LEAFMINER (<i>Agromyza frontella</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                     |                            |                                    |     |                                                                                                                                                                                                                                                                                                                                                          |
| <b>Foliar Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                     |                            |                                    |     |                                                                                                                                                                                                                                                                                                                                                          |
| Natural enemies are highly effective at controlling this pest. For the safety of these natural enemies, chemical control is not recommended unless pest population exceeds the action threshold. See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , for more information.                                                                                                                                                                                                                                                                    | dimethoate          | Cygon 480 E<br>Lagon 480 E | 550 mL/ha<br>(220 mL/acre)         | 2   | Ground and aerial application. Maximum 2 applications/yr. This product is toxic to bees. Restrict application to the period after dark when bees are inside the hives, or in the early morning before the bees are foraging in the fields. <b>DO NOT</b> apply to such crops as alfalfa when in full bloom.                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | phosmet             | Imidan 50 WP               | 2.25 kg/ha<br>(900 g/acre)         | 7   | <b>For use in alfalfa only. Ground application only.</b> Maximum 3 applications/yr. <b>DO NOT</b> apply more than 1 application per cutting. 5-day re-entry period. Toxic to bees. <b>DO NOT</b> apply to flowering crops or weeds if bees are visiting the treatment area.                                                                              |
| <b>ARMYWORM (TRUE — <i>Pseudaletia unipuncta</i>, FALL — <i>Spodoptera frugiperda</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                     |                            |                                    |     |                                                                                                                                                                                                                                                                                                                                                          |
| Control is warranted when 5 or more larvae (smaller than 2.5 cm) per 30 cm x 30 cm (1 ft <sup>2</sup> ) are found. Avoid treating with insecticides when large numbers of parasitized larvae are present. In seedling crops, 2–3 larvae (smaller than 2.5 cm) per 30 cm x 30 cm may warrant control. If larvae have white eggs attached to them, they are parasitized and may not need treatment. If the larvae are almost full grown (2.5 cm or larger), there is no benefit in applying insecticide since most of the feeding damage has already been done. | carbaryl            | Sevin XLR Plus             | 2.5–5.25 L/ha<br>(1.0–2.1 L/acre)  | 2   | For use in alfalfa, clover and forage grasses. 1-day re-entry period for beef cattle. 2-day re-entry period for dairy cattle. This product is highly toxic to honeybees exposed to direct treatment on blooming crops or weeds. Apply SEVIN XLR PLUS from late evening to early morning or when bees are not foraging.                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | chlorantraniliprole | Coragen                    | 250–375 mL/ha<br>(101–151 mL/acre) | 0   | <b>For use in grass forages for seed production only. Ground application only.</b> Begin applications when treatment thresholds have been reached. Thorough coverage is important. Use a minimum of 100 L/ha of water by ground. Do not feed treated crop to livestock. Maximum 1 application/cutting. Maximum 4 applications/yr. 12-hr re-entry period. |

## FORAGE CROP DISEASES

**Table 3–4.** Chemical Control Options for Seed and Root Rot Diseases in Forage Crops — Phytophthora Root Rot, Pythium Damping-Off

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Active Ingredient | Trade Name                | Rate                                                                                                        | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------------------------|-------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>PHYTOPHTHORA ROOT ROT (<i>Phytophthora medicaginis</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                   |                           |                                                                                                             |                                                                                                                                                                                                                                                                                                                                                   |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                   |                           |                                                                                                             |                                                                                                                                                                                                                                                                                                                                                   |
| Plant resistant varieties that are treated with metalaxyl or metalaxyl-M. Consult with your seed company and the Ontario Forage Crops Committee Variety Trial Results at <a href="http://GoForages.ca">GoForages.ca</a> for variety profiles. Drain excess moisture from soil and avoid compaction. Avoid other stresses such as insects, weeds and untimely cuttings that may stress the plants and make them more susceptible to phytophthora. Do not cut during wet conditions. Crop rotation has little effect on the disease. Promote lateral root growth by following a good fertility program. | metalaxyl-M       | Apron XL LS               | 40 mL/<br>100 kg seed                                                                                       | <b>For use in commercial seed treatment facilities only.</b> Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at or immediately before planting. Do not graze or feed livestock on seeded area for 4 weeks after planting. Read label for information regarding resistant strains of fungus. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | metalaxyl         | Allegiance FL<br>Apron FL | 46–110 mL/<br>100 kg seed                                                                                   | For commercial and on-farm treating. Do not graze or feed livestock on seeded area for 4 weeks after planting.                                                                                                                                                                                                                                    |
| <b>PYTHIUM DAMPING-OFF (<i>Pythium</i> spp.)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                   |                           |                                                                                                             |                                                                                                                                                                                                                                                                                                                                                   |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                   |                           |                                                                                                             |                                                                                                                                                                                                                                                                                                                                                   |
| Drain excess moisture from the soil and avoid compaction. Plant seed when soil and weather conditions favour rapid emergence and early growth of seedlings. Increase plant populations to compensate for any plant losses.                                                                                                                                                                                                                                                                                                                                                                            | metalaxyl-M       | Apron XL LS               | forage grasses:<br>20–40 mL/<br>100 kg seed<br>alfalfa, clover,<br>trefoil, vetch:<br>40 mL/<br>100 kg seed | <b>For use in commercial seed treatment facilities only.</b> Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed-treatment applications at or immediately before planting. Do not graze or feed livestock on seeded area for 4 weeks after planting. Read label for information on resistant strains of fungus.        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | metalaxyl         | Allegiance FL<br>Apron FL | 46–110 mL/<br>100 kg seed                                                                                   | For commercial and on-farm treating. Do not graze or feed livestock on seeded area for 4 weeks after planting.                                                                                                                                                                                                                                    |

## FORAGE CROP DISEASES

**Table 3–5.** Chemical Control Options for Foliar and Stem Diseases in Forage Crops — Verticillium Wilt, White Mould/Blossom Blight

| <b>LEGEND:</b> PHI = Pre-Harvest Interval (in days)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                  | N/A = not applicable |                                     |     |                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|----------------------|-------------------------------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Active Ingredient                | Trade Name           | Rate                                | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                               |
| <b>VERTICILLIUM WILT (<i>Verticillium albo-atrum</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                  |                      |                                     |     |                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                  |                      |                                     |     |                                                                                                                                                                                                                                                                                                                                                                    |
| Planting resistant or highly resistant varieties is the best means of control for this disease. Consult with your seed company and the Ontario Forage Crops Committee Variety Trial Results at <a href="http://www.uoguelph.ca/plant/performance_recommendations/ofcc/ofcc.htm">www.uoguelph.ca/plant/performance_recommendations/ofcc/ofcc.htm</a> for variety profiles. The fungus is spread primarily on the cutting bar of forage harvesting equipment. Before harvesting, clean the cutting bar with a 1% solution of bleach followed by a clean water rinse and oil spray. Cut the youngest fields first, working towards the oldest fields. Wait 2–3 yr between alfalfa crops. Maintain a good weed control program, since some weeds can be alternate hosts. | thiram                           | Thiram 75 WP         | 360 g/<br>100 kg seed               | N/A | <b>For use on alfalfa only.</b> Do not graze treated areas or feed clippings from treated areas to livestock.                                                                                                                                                                                                                                                      |
| <b>WHITE MOULD/BLOSSOM BLIGHT (<i>Sclerotinia sclerotiorum</i>/<i>Botrytis cinerea</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                  |                      |                                     |     |                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Foliar Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                  |                      |                                     |     |                                                                                                                                                                                                                                                                                                                                                                    |
| There are some differences in white mould susceptibility between cultivars. Check with your seed company for disease ratings. Fields established under minimum tillage may have more disease incidence. Spring planting may reduce disease incidence.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | boscalid                         | Lance                | 420 g/ha<br>(170 g/acre)            | N/A | <b>For use in alfalfa for seed production only.</b> Ground and aerial application. Apply at 20%–50% flowering. Apply every 7–14 days if disease persists or weather conditions are favourable for disease development. Do not graze or feed treated hay to livestock. Maximum 3 applications/yr. 12-hr re-entry period.                                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | penthiopyrad                     | Fontelis             | 1.25–1.75 L/ha<br>(500–700 mL/acre) | N/A | Ground and aerial application. Make initial application prior to disease development and continue on a 7–14-day interval. Use higher rate and shorter interval when disease pressure is high. Make no more than 2 sequential applications of Fontelis before switching to a fungicide with a different mode of action. Maximum 3.5 L/ha/yr. 12-hr re-entry period. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | pyraclostrobin<br>+ fluxapyroxad | Priaxor              | 0.45 L/ha<br>(180 mL/acre)          | 21  | <b>For use in alfalfa for seed production only.</b> Ground and aerial application. Apply at the beginning of flowering (10%–30% bloom) or at the onset of disease. Maximum 1 applications/yr. 12-hr re-entry period.                                                                                                                                               |

## FORAGE CROP DISEASES

**Table 3–6.** Chemical Control Options for Foliar and Stem Diseases in Forage Crops — Common Leaf Spot, Leaf Spot, Spring Black Stem

| LEGEND: PHI = Pre-Harvest Interval (in days)      N/A = not applicable                                                                                                                                                                                                                                                                                                                       |                               |               |                            |     |                                                                                                                                                                                                                                                                                                                         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|---------------|----------------------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                           | Active Ingredient             | Trade Name    | Rate                       | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                    |
| COMMON LEAF SPOT ( <i>Pseudopeziza medicaginis</i> )                                                                                                                                                                                                                                                                                                                                         |                               |               |                            |     |                                                                                                                                                                                                                                                                                                                         |
| Foliar Treatment                                                                                                                                                                                                                                                                                                                                                                             |                               |               |                            |     |                                                                                                                                                                                                                                                                                                                         |
| Timely harvesting of forages is important to reduce leaf loss and minimize disease in the re-growth. There are no practical control strategies available for leaf spot diseases in forages. Balance the time of harvest between the optimum stage for highest protein (bud stage in alfalfa) and the level of leaf spot disease, as leaf spot can reduce the protein level in legume leaves. | boscalid                      | Lance         | 420 g/ha<br>(170 g/acre)   | N/A | <b>For use in alfalfa for seed production only.</b> Ground and aerial application. Apply at 20%–50% flowering. Apply every 7–14 days if disease persists or weather conditions are favourable for disease development. Do not graze or feed treated hay to livestock. Maximum 3 applications/yr. 12-hr re-entry period. |
|                                                                                                                                                                                                                                                                                                                                                                                              | mancozeb                      | Dithane DG    | 1.46 kg/ha<br>(584 g/acre) | N/A | <b>For use in alfalfa for seed production only.</b> Ground and aerial application. Apply prior to 50% bloom. Repeat 7–10 days after 1st application and 10 days after second application. Do not graze treated crop or cut for hay. Maximum 3 applications/yr.                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                              |                               | Rainshield NT |                            |     |                                                                                                                                                                                                                                                                                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                              | pyraclostrobin + fluxapyroxad | Priaxor       | 0.3 L/ha<br>(120 mL/acre)  | 21  | <b>For use in alfalfa for seed production only.</b> Ground and aerial application. Apply at the beginning of flowering (10%–30% bloom) or at the onset of disease. Maximum 1 applications/yr. 12-hr re-entry period.                                                                                                    |
| LEAF SPOT ( <i>Leptosphaerulina trifolii</i> )                                                                                                                                                                                                                                                                                                                                               |                               |               |                            |     |                                                                                                                                                                                                                                                                                                                         |
| Foliar Treatment                                                                                                                                                                                                                                                                                                                                                                             |                               |               |                            |     |                                                                                                                                                                                                                                                                                                                         |
| Timely harvesting of forages is important to reduce leaf loss and minimize disease in the re-growth. There are no practical control strategies available for leaf spot diseases in forages. Balance the time of harvest between the optimum stage for highest protein (bud stage in alfalfa) and the level of leaf spot disease, as leaf spot can reduce the protein level in legume leaves. | boscalid                      | Lance         | 420 g/ha<br>(170 g/acre)   | N/A | <b>For use in alfalfa for seed production only.</b> Ground and aerial application. Apply at 20%–50% flowering. Apply every 7–14 days if disease persists or weather conditions are favourable for disease development. Do not graze or feed treated hay to livestock. Maximum 3 applications/yr. 12-hr re-entry period. |
|                                                                                                                                                                                                                                                                                                                                                                                              | mancozeb                      | Dithane DG    | 1.46 kg/ha<br>(584 g/acre) | N/A | <b>For use in alfalfa for seed production only.</b> Ground and aerial application. Apply prior to 50% bloom. Repeat 7–10 days after 1st application and 10 days after second application. Do not graze treated crop or cut for hay. Maximum 3 applications/yr.                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                              |                               | Rainshield NT |                            |     |                                                                                                                                                                                                                                                                                                                         |
| SPRING BLACK STEM ( <i>Phoma medicaginis</i> )                                                                                                                                                                                                                                                                                                                                               |                               |               |                            |     |                                                                                                                                                                                                                                                                                                                         |
| Foliar Treatment                                                                                                                                                                                                                                                                                                                                                                             |                               |               |                            |     |                                                                                                                                                                                                                                                                                                                         |
| This disease is favoured by cool, wet weather conditions.                                                                                                                                                                                                                                                                                                                                    | boscalid                      | Lance         | 420 g/ha<br>(170 g/acre)   | N/A | <b>For use in alfalfa for seed production only.</b> Ground and aerial application. Apply at 20%–50% flowering. Apply every 7–14 days if disease persists or weather conditions are favourable for disease development. Do not graze or feed treated hay to livestock. Maximum 3 applications/yr. 12-hr re-entry period. |

## 4. Cereals

### WHEAT, BARLEY, OAT AND RYE INSECTS

**Table 4-1.** Chemical Control Options for Insects in Cereals (Wheat, Barley and Oats) — Wireworms, European Chafer

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                     | Active Ingredient                            | Trade Name              | Rate                                                                    | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|-------------------------|-------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>WIREWORMS (<i>Limonius</i> spp. and others)</b>                                                                                                                                                                                                                                                                                                                                                                     |                                              |                         |                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                  |                                              |                         |                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , for sampling methods. 1 wireworm/bait trap warrants control.                                                                                                                                                                                                                                                                                       | thiamethoxam                                 | Cruiser 5 FS            | 33–50 mL/<br>100 kg seed                                                | For use in wheat, barley and rye. For use in on-farm or commercial seed treatment facilities. Use higher rate in fields with a history of high infestations of larvae. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                        | imidacloprid                                 | Alias 240 SC            | 42–125 mL/<br>100 kg seed                                               | Use higher rates for fields with history of moderate-to-high wireworm pressure.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                        | clothianidin                                 | NipsIt Inside 600       | (17 mL/<br>100 kg seed<br>for suppression)<br>33–100 mL/<br>100 kg seed | For use in commercial seed treatment facilities or on-farm.<br>Use higher rates on wheat seed to be planted into fields known to have a history of severe wireworm infestations for protection to seed and seedlings.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                        | clothianidin<br>+ metalaxyl<br>+ metconazole | NipsIt SUITE Cereals OF | 326 mL/<br>100 kg seed                                                  | <b>Suppression only.</b> The product is formulated for use as an on-farm and commercial seed treatment product.<br>Do not make any subsequent application of a Group 4 insecticide (e.g., in-furrow or foliar application) following treatment with NipsIt SUITE Cereals OF seed protectant.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>GRUB — EUROPEAN CHAFER (<i>Rhizotrogus majalis</i>)</b>                                                                                                                                                                                                                                                                                                                                                             |                                              |                         |                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| High-risk areas for chafer within a field include sandy knolls and areas bordering turf, pasture and tree lines. Chafer grub infestations can occur 1 year after soybean crops on sandy soils. Avoid planting winter wheat if chafer grub populations are extreme (more than four grubs per 30 cm x 30 cm (1 ft <sup>2</sup> )). See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , for more details. | thiamethoxam                                 | Cruiser 5 FS            | 50 mL/<br>100 kg seed                                                   | For use in wheat and barley. For use in on-farm or commercial seed treatment facilities. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                        | imidacloprid                                 | Stress Shield 600       | 17–50 mL/<br>100 kg seed<br>(10–30 g ai/<br>100 kg seed)                | <b>For use in commercial seed treatment equipment only in Eastern Canada.</b><br>For fields with a history of moderate-to-high wireworm pressure, treat crops at 50 mL/100 kg seed.<br>For control of certain seed and soil-borne pathogens in wheat, barley and oat seeds and seedlings, Stress Shield 600 may be mixed with Raxil T, Raxil MD or EverGol Energy. Follow all appropriate directions and precautions as specified on the fungicide labels.<br>Use high rate for early seeding, when insect populations are expected to be high or extended control period for aphids is needed. This product contains no colourant. Seed treated with this product must be conspicuously coloured. Do not graze or feed livestock on treated areas for 4 weeks after planting.<br>Do not apply any subsequent application of a Group 4 insecticide (e.g., in-furrow or foliar application) following treatment with Stress Shield 600. |

## WHEAT, BARLEY, OAT AND RYE INSECTS

**Table 4–2.** Chemical Control Options for Insects in Cereals (Wheat, Barley and Oats) — Armyworm, Cereal Leaf Beetle

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Active Ingredient   | Trade Name        | Rate                                | PHI                                                          | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|-------------------|-------------------------------------|--------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>ARMYWORM (TRUE – <i>Pseudaletia unipuncta</i>, FALL – <i>Spodoptera frugiperda</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                     |                   |                                     |                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Chemical control is warranted by four to five larvae in a 30-cm-x-30-cm area. Treat if larvae are smaller than 2.0 cm long and threshold has been exceeded. If larvae have white eggs attached to them, they are parasitized and may not require treatment.                                                                                                                                                                                                                                                                                                                             | carbaryl            | Sevin XLR Plus    | 2.5–5.25 L/ha<br>(1.0–2.1 L/acre)   | wheat, rye, oat:<br>14<br>barley: 28                         | This product is highly toxic to honeybees exposed to direct treatment on blooming crops or weeds. Apply SEVIN XLR PLUS from late evening to early morning or when bees are not foraging.                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | methomyl            | Lannate Toss-N-Go | 270–540 g/ha<br>(108–216 g/acre)    | 20                                                           | Ground and aerial application. 24-hr re-entry period. Toxic to bees exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application.                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | lambda-cyhalothrin  | Matador 120 E     | 83 mL/ha<br>(34 mL/acre)            | wheat,<br>barley, oat:<br>28<br>livestock<br>foraging:<br>14 | Ground and aerial application. Use 100–200 L of water/ha. Allow a 7-day interval between treatments. Maximum 3 applications/yr. Do not apply more than 2 applications by air. 24-hr re-entry period. This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | spinetoram          | Delegate WG       | 100–200 g/ha<br>(40–80 g/acre)      | 21                                                           | <b>Ground application only.</b> Use higher rate for heavy infestations or advanced pest stages. Spray tank solution pH should be between 6 and 8 for optimal control. Minimum 5 days between treatments. Maximum 3 applications/yr. 12-hr re-entry period. Toxic to bees exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area.                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | chlorantraniliprole | Coragen           | 250–375 mL/ha<br>(101–151 mL/acre)  | 1                                                            | Ground and aerial application. Maximum of 3 applications/yr. Do not exceed a total of 1.125 L of Coragen per season. Use a minimum 100 L/ha by ground or 50 L/ha aerial.                                                                                                                                                                                                                                                                                                                                                    |
| <b>CEREAL LEAF BEETLE (<i>Oulema melanopus</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                     |                   |                                     |                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Control is warranted if an average of three larvae per tiller are found before boot stage. One CLB adult or larvae per stem warrants control after boot but prior to heading. If significant feeding is taking place on the flag leaf in the early heading stages, control may be warranted. Natural enemies are highly effective at controlling this pest. For the safety of these natural enemies, chemical control is not recommended unless pest population exceeds the action threshold. See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , for more information. | malathion           | Malathion 500 EC  | 550–1100 mL/ha<br>(202–445 mL/acre) | 7                                                            | Product is less effective at temperatures below 20°C. Toxic to bees exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flower crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.                                                                                                                                                                        |

## WHEAT, BARLEY, OAT AND RYE INSECTS

**Table 4–3.** Chemical Control Options for Insects in Cereals (Wheat, Barley and Oats) — Grasshoppers

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Active Ingredient   | Trade Name       | Rate                                  | PHI                                              | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------------------|---------------------------------------|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>GRASSHOPPERS (various species)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                     |                  |                                       |                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Grasshoppers are more abundant in drier years. If populations are high enough, wheat heads may be clipped. Seedling winter wheat is also at risk. Infestations usually begin along field borders. Early-season weed control can help eliminate food source for early-season nymphs, however, late-season weed control in and around the field will actually cause this insect to migrate from the weeds onto the crop and cause damage. If populations are high, spot spray in border areas that are infested before migration into the field occurs. | malathion           | Malathion 500 EC | 2.25–2.75 L/ha<br>(900–1,100 mL/acre) | 7                                                | Product is less effective at temperatures below 20°C.<br><br>Toxic to bees exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flower crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | cypermethrin        | Mako             | 50–70 mL/ha<br>(20–28 mL/acre)        | wheat: 30<br>barley: 45                          | For use in wheat and barley. <b>Ground application only.</b> Use lower rates for small grasshoppers and when soil temperatures are cool (15°C–20°C). Avoid spraying when temperatures are above 25°C. Repeat treatment as necessary. Do not graze treated crop or cut for hay.<br><br>Toxic to bees and other beneficial insects. Avoid spraying when bees are foraging.                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | lambda-cyhalothrin  | Matador 120 E    | 63–83 mL/ha<br>(26–34 mL/acre)        | wheat, barley, oat: 28<br>livestock foraging: 14 | Ground and aerial application. Apply the low rate when grasshoppers are up to the 3rd nymph stage (up to 1 cm in length) or when insect numbers are low. Apply the high rate when grasshoppers are larger, up to but not including winged adults (up to 2.5 cm in length) or when insect numbers are high. Allow a 7-day interval between treatments. Maximum 3 applications/yr. Do not apply more than 2 applications by air. 24-hr re-entry period.<br><br>This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                     | Silencer 120 EC  |                                       |                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | carbaryl            | Sevin XLR Plus   | 1.25–2.5 L/ha<br>(0.5–1.0 L/acre)     | wheat, rye, oat: 14<br>barley: 28                | This product is highly toxic to honeybees exposed to direct treatment on blooming crops or weeds. Apply SEVIN XLR PLUS from late evening to early morning or when bees are not foraging.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | spinetoram          | Delegate WG      | 100–200 g/ha<br>(40–80 mg/acre)       | 21                                               | <b>Ground application only.</b> Minimum of 5 days between applications. Spray tank solution pH should be between 6 and 8 for optimal control. Maximum 3 applications/yr. 12-hr re-entry period.<br><br>Toxic to bees exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area.                                                                                                                                                                                                                                                                                                                                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | chlorantraniliprole | Coragen          | 250–375 mL/ha<br>(101–151 mL/acre)    | 1                                                | Ground and aerial application. Maximum of 3 applications/yr. Do not exceed a total of 1.125 L of Coragen per season. Use a minimum 100 L/ha by ground or 50 L/ha aerial.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

## WHEAT, BARLEY, OAT AND RYE INSECTS

**Table 4–4.** Chemical Control Options for Insects in Cereals (Wheat, Barley and Oats) — Cereal Aphids

| <b>LEGEND:</b> PHI = Pre-Harvest Interval (in days)      N/A = not applicable                                                                                                                                                                              |                   |                   |                              |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------------|------------------------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Integrated Pest Management Options                                                                                                                                                                                                                         | Active Ingredient | Trade Name        | Rate                         | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>CEREAL APHIDS (various species)</b>                                                                                                                                                                                                                     |                   |                   |                              |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                      |                   |                   |                              |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Fields planted in late summer or early fall (August/September) are at the highest risk of fall infestations. Volunteer cereals allow aphids to survive until the host crop is planted and can increase the risk of the virus being vectored into the crop. | clothianidin      | NipsIt Inside 600 | 50 mL/<br>100 kg seed        | N/A | For commercial and on-farm treating. For early-season protection of wheat seedlings against aphid feeding.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Foliar Treatment</b>                                                                                                                                                                                                                                    |                   |                   |                              |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Apply once the action threshold has been reached: Prior to the heading stage, 12–15 cereal aphids per stem and up to 50 aphids per head once headed.                                                                                                       | dimethoate        | Cygon 480 EC      | 1 L/ha<br>(400 mL/acre)      | 2   | Ground and aerial application. For ground application, use sufficient water to obtain good coverage (100–275 L/ha). With aerial application, use 10–30 L of water/ha. Maximum 2 applications/year.<br><br>This product is toxic to bees. Restrict application to the period after dark when bees are inside the hives, or in the early morning before the bees are foraging in the fields. <b>DO NOT</b> apply to such crops as alfalfa when in full bloom.                                                                                                                                                              |
|                                                                                                                                                                                                                                                            | sulfoxaflor       | Transform WG      | 25–50 g/ha<br>(10–24 g/acre) | 14  | <b>Wheat and barley only.</b> Maximum 2 applications per year. Do not apply more than 22 g/ha per year. Ground and aerial application. For ground application, use a minimum of 100 L of water/ha. For aerial application, use a minimum of 30 L of water/ha.<br><br>Toxic to bees. Do not apply this product during crop flowering period or when flowering weeds are present in the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. Apply early in the morning or late in the evening when bees are not active. Toxic to certain beneficial insects. |

## Seed Rots and Seed-Borne Diseases

Use good-quality, clean seed. Apply fungicide seed treatment to all wheat seed to control soil-borne and seed-borne diseases such as seed rots and seedling blights, seed-borne septoria, seed-borne fusarium seedling blight, seed-borne dwarf bunt, common bunt and loose smut. The best protection against seedling blights, smut and the bunts can be achieved through the use of a seed treatment that contains a combination of fungicides, since no one fungicide is effective against all these diseases. Good coverage of the seed is essential, otherwise performance will be reduced.

## WHEAT DISEASES

**Table 4–5.** Chemical Control Options for Seed Rots and Seed-Borne Diseases in Wheat — Seed-Borne Septoria

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Active Ingredient                       | Trade Name      | Rate                   | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-----------------|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SEED-BORNE SEPTORIA (<i>Stagonospora nodorum</i>, formerly <i>Septoria nodorum</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                         |                 |                        |                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                         |                 |                        |                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Infected seed is lightweight and shrivelled. Fungicide seed treatment is very effective against this disease. Other options include the use of tolerant varieties and disease-free seed. Consult with your seed company and the Ontario Cereal Crops Committee Variety Trial Results at <a href="http://www.gocereals.ca">www.gocereals.ca</a> for variety profiles. Plant into a well-prepared seed bed under good growing conditions. Use wheat in at least a 3-yr rotation since the disease can survive in wheat residue. | difenoconazole + metalaxyl-M            | Dividend XL RTA | 650 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 35 days of planting.                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | tebuconazole + thiram                   | Raxil T         | 225 mL/100 kg seed     | For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                                                                                                                                                                                                                                                                                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | tebuconazole + metalaxyl-M              | Raxil MD        | 300 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provide good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | difenoconazole + metalaxyl-M + sedaxane | Vibrance XL     | 180–360 mL/100 kg seed | <b>For use in commercial seed treatment facilities only.</b> For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed. For control of seed-borne septoria and early-season septoria leaf blotch, use the 360 mL/100 kg seed rate. |

## WHEAT DISEASES

**Table 4–6.** Chemical Control Options for Seed Rots and Seed-Borne Diseases in Wheat — Fusarium

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Active Ingredient                          | Trade Name      | Rate                    | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-----------------|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SEED-BORNE, SEED ROT and SEEDLING BLIGHT (<i>FUSARIUM</i> spp.)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                            |                 |                         |                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                            |                 |                         |                                                                                                                                                                                                                                                                                                                                                                                                      |
| Infected seed is lightweight and shrivelled. Fungicide seed treatment is very effective against this disease. Other options include the use of tolerant varieties and disease-free seed. Consult with your seed company and the Ontario Cereal Crops Committee Variety Trial Results at <a href="http://www.gocereals.ca">www.gocereals.ca</a> for variety profiles. Plant into a well-prepared seedbed under good growing conditions. Use wheat in at least a 3-yr rotation since the disease can survive in wheat residue. Avoid planting wheat after corn. | tebuconazole + thiram                      | Raxil T         | 225 mL/100 kg seed      | For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                                                                                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | tebuconazole + metalaxyl-M                 | Raxil MD        | 300 mL/100 kg seed      | For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provides good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | difenoconazole + metalaxyl-M               | Dividend XL RTA | 325–650 mL/100 kg seed  | For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 35 days of planting.                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | triticonazole + thiram                     | Gemini          | 360 mL/100 kg seed      | For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder.                                                                                                                                                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ipconazole                                 | Rancona Apex    | 325 mL/100 kg seed      | For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 30 days after planting.                                                                                                                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | fludioxonil                                | Proseed         | 5.2–10.4 mL/100 kg seed | <b>For use in commercial seed treatment facilities only.</b> Use in combination with Dividend XL RTA for broad spectrum control.                                                                                                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | penflufen + prothioconazole + metalaxyl    | EverGol Energy  | 65 mL/100 kg seed       | For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | tebuconazole + prothioconazole + metalaxyl | Raxil Pro MD    | 325 mL/100 kg seed      | For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provide good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | difenoconazole + metalaxyl-M + sedaxane    | Vibrance XL     | 180–360 mL/100 kg seed  | <b>For use in commercial seed treatment facilities only.</b> For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | penflufen + prothioconazole + metalaxyl    | EverGol Energy  | 65 mL/100 kg seed       | For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.                                                                                                   |

## WHEAT DISEASES

**Table 4–6.** Chemical Control Options for Seed Rots and Seed-Borne Diseases in Wheat — Fusarium

| Integrated Pest Management Options                                              | Active Ingredient                                              | Trade Name                 | Rate                   | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------------------------------------------------------|----------------------------------------------------------------|----------------------------|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SEED-BORNE, SEED ROT and SEEDLING BLIGHT (<i>FUSARIUM</i> spp.) (cont'd)</b> |                                                                |                            |                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Seed Treatment (cont'd)</b>                                                  |                                                                |                            |                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| (cont'd)                                                                        | clothianidin<br>+ metalaxyl<br>+ metconazole                   | NipsIt SUITE<br>Cereals OF | 326 mL/<br>100 kg seed | For commercial and on-farm treating.<br><br>Not for use in hopper-box, slurry-box or similar seed treatment applications used at planting. This product is to be used in liquid or slurry treaters. Mix thoroughly before use. Do not make any subsequent application of a Group 4 insecticide (e.g., in-furrow or foliar application) following treatment with NipsIt SUITE Cereals OF seed protectant.<br><br>NipsIt SUITE Cereals OF seed protectant is a ready-to-use product, which includes red colourant (according to regulations pertaining to the <i>Seeds Act</i> ). No additional colourant, dyes, binders, polymers or water are required. |
|                                                                                 | difenoconazole<br>+ metalaxyl-m<br>+ sedaxane<br>+ fludioxonil | Vibrance<br>Quattro        | 325 mL/<br>100 kg seed | For commercial and on-farm treating. Apply this product utilizing seed treatment equipment that provides uniform seed coverage. Uneven or incomplete seed coverage may not give the desired level of disease control. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                                                                                                                                                                                                       |

## WHEAT DISEASES

Table 4–7. Chemical Control Options for Seedling Diseases in Wheat — Common Root Rot (Common Blight)

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                        | Active Ingredient                                     | Trade Name              | Rate                   | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|-------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>COMMON ROOT ROT (COMMON BLIGHT) (<i>Cochliobolus sativus</i>)</b>                                                                                                                                                                                                                                                                                                      |                                                       |                         |                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                                                                     |                                                       |                         |                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Infected plants can be found individually or in irregular patches. These plants are often stunted and yellow (chlorotic) with a dark browning or blackening of the subcrown internodes. Drought and warm temperatures favour root rot. Maintain sound soil health practices and use good 3-yr crop rotation using non-host crops. Avoid soil compaction and deep seeding. | difenoconazole + metalaxyl-M                          | Dividend XL RTA         | 325–650 mL/100 kg seed | <b>Provides suppression only.</b> For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 35 days of planting.                                                                                                                                                                                                                                                                                                                                            |
|                                                                                                                                                                                                                                                                                                                                                                           | ipconazole                                            | Rancona Apex            | 325 mL/100 kg seed     | <b>Provides suppression only.</b> For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 30 days after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                           | tebuconazole + thiram                                 | Raxil T                 | 225 mL/100 kg seed     | <b>Provides suppression only.</b> For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 6 weeks after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                           | tebuconazole + metalaxyl-M                            | Raxil MD                | 300 mL/100 kg seed     | <b>Provides suppression only.</b> For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provides good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                                                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                           | carbathiin + thiram                                   | Vitaflo 280             | 230–330 mL/100 kg seed | <b>Provides suppression only. For commercial seed treatment facilities only.</b> Do not graze or feed livestock on treated areas for 6 weeks after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                                                                                                                                                                                                                                                                                                                                                           | penflufen + prothioconazole + metalaxyl               | EverGol Energy          | 65 mL/100 kg seed      | For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.                                                                                                                                                                                                                                                                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                           | tebuconazole + prothioconazole + metalaxyl            | Raxil Pro MD            | 325 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provide good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                                                                                           | difenoconazole + metalaxyl-M + sedaxane               | Vibrance XL             | 180–360 mL/100 kg seed | <b>For use in commercial seed treatment facilities only.</b> For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.                                                                                                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                                                                                                                                                                           | difenoconazole + metalaxyl-m + sedaxane + fludioxonil | Vibrance Quattro        | 325 mL/100 kg seed     | For commercial and on-farm treating. Apply this product utilizing seed treatment equipment that provides uniform seed coverage. Uneven or incomplete seed coverage may not give the desired level of disease control. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                                                                                                                                                                           | clothianidin + metalaxyl + metconazole                | NipsIt SUITE Cereals OF | 326 mL/100 kg seed     | For commercial and on-farm treating.<br>Not for use in hopper-box, slurry-box or similar seed treatment applications used at planting. This product is to be used in liquid or slurry treaters. Mix thoroughly before use. Do not make any subsequent application of a Group 4 insecticide (e.g., in-furrow or foliar application) following treatment with NipsIt SUITE Cereals OF seed protectant.<br>NipsIt SUITE Cereals OF seed protectant is a ready-to-use product, which includes red colourant (according to regulations pertaining to the Seeds Act). No additional colourant, dyes, binders, polymers or water are required. |

## WHEAT DISEASES

Table 4–8. Chemical Control Options for Seedling Diseases in Wheat — Pythium Damping-Off

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                | Active Ingredient                          | Trade Name      | Rate                       | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-----------------|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>PYTHIUM DAMPING-OFF (<i>Pythium</i> spp.)</b>                                                                                                                                                                                                                                                                                  |                                            |                 |                            |                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                             |                                            |                 |                            |                                                                                                                                                                                                                                                                                                                                                                                                      |
| This disease can occur on all soil types but losses are greatest in cold, wet clay soils. Minimize soil compaction and remove excess moisture through increased drainage. Seed treatments containing metalaxyl or metalaxyl-M can reduce infection. Delay planting until conditions will result in a rapid and uniform emergence. | difenoconazole + metalaxyl-M               | Dividend XL RTA | 325–650 mL/<br>100 kg seed | For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 35 days of planting.                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                   | difenoconazole + metalaxyl-M + sedaxane    | Vibrance XL     | 180–360 mL/<br>100 kg seed | <b>For use in commercial seed treatment facilities only.</b> For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.                                                                    |
|                                                                                                                                                                                                                                                                                                                                   | metalaxyl-M                                | Apron XL LS     | 20–40 mL/<br>100 kg seed   | <b>For use in commercial seed treatment facilities only.</b> Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at or immediately before planting. Read the label for information regarding resistant strains of fungus. Do not graze or feed livestock on seeded area for 4 weeks after planting.                                                |
|                                                                                                                                                                                                                                                                                                                                   | triticonazole + thiram                     | Gemini          | 360 mL/<br>100 kg seed     | For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder.                                                                                                                                                                                                                      |
|                                                                                                                                                                                                                                                                                                                                   | tebuconazole + metalaxyl-M                 | Raxil MD        | 300 mL/<br>100 kg seed     | For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provides good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting. |
|                                                                                                                                                                                                                                                                                                                                   | tebuconazole + thiram                      | Raxil T         | 225 mL/<br>100 kg seed     | For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                                                                                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                                                   | penflufen + prothioconazole + metalaxyl    | EverGol Energy  | 65 mL/<br>100 kg seed      | For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                   | tebuconazole + prothioconazole + metalaxyl | Raxil Pro MD    | 325 mL/<br>100 kg seed     | For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provide good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.  |

## WHEAT DISEASES

**Table 4–8.** Chemical Control Options for Seedling Diseases in Wheat — Pythium Damping-Off

| Integrated Pest Management Options                        | Active Ingredient                                              | Trade Name              | Rate                     | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------------------------------|----------------------------------------------------------------|-------------------------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>PYTHIUM DAMPING-OFF (<i>Pythium</i> spp.) (cont'd)</b> |                                                                |                         |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Seed Treatment (cont'd)</b>                            |                                                                |                         |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| (cont'd)                                                  | ethaboxam                                                      | Intego Solo Fungicide   | 13–17 mL/<br>100 kg seed | <p>For commercial and on-farm treating. Regulations under the Seeds Act require that an appropriate colourant must be added when this product is applied to seed. A red colourant must be added when this product is applied to grain.</p> <p>For best results, use Intego Solo Fungicide combined with other oomycete-active seed treatment fungicides, such as metalaxyl, to broaden the spectrum of activity. Intego Solo Fungicide can also be used in combination with a broad-spectrum registered seed treatment fungicide having activity against <i>Rhizoctonia solani</i> and other fungal pathogens inciting seed and seedling disease.</p> <p>To deliver 5 g ai/100 kg seed, apply 0.44 mL per 100,000 seeds (equals 0.0017 mg ai/seed) based on 28,634 seed/kg count.</p> |
|                                                           | clothianidin<br>+ metalaxyl<br>+ metconazole                   | NipsIt SUITE Cereals OF | 326 mL/<br>100 kg seed   | <p>For commercial and on-farm treating.</p> <p>Not for use in hopper-box, slurry-box or similar seed treatment applications used at planting. This product is to be used in liquid or slurry treaters. Mix thoroughly before use. Do not make any subsequent application of a Group 4 insecticide (e.g., in-furrow or foliar application) following treatment with NipsIt SUITE Cereals OF seed protectant.</p> <p>NipsIt SUITE Cereals OF seed protectant is a ready-to-use product that includes red colourant (according to regulations pertaining to the Seeds Act). No additional colourant, dyes, binders, polymers or water are required.</p>                                                                                                                                  |
|                                                           | difenoconazole<br>+ metalaxyl-m<br>+ sedaxane<br>+ fludioxonil | Vibrance Quattro        | 325 mL/<br>100 kg seed   | <p>For commercial and on-farm treating. Apply this product utilizing seed treatment equipment that provides uniform seed coverage. Uneven or incomplete seed coverage may not give the desired level of disease control. Do not graze or feed livestock on treated areas for 45 days after planting.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

## WHEAT DISEASES

Table 4–9. Chemical Control Options for Seedling Diseases in Wheat — *Penicillium*, *Aspergillus* Seed Rot, Dwarf Bunt

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Active Ingredient                                     | Trade Name       | Rate                    | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|------------------|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>PENICILLIUM (<i>Penicillium</i> spp.) and ASPERGILLUS SEED ROT (<i>Aspergillus</i> spp.)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                       |                  |                         |                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                       |                  |                         |                                                                                                                                                                                                                                                                                                                                                                                                     |
| Both of these diseases are considered storage moulds. Their incidence increases when wheat is stored under warm temperatures and moist conditions. Seed that is damaged is especially susceptible under these conditions. Maintain grain at less than 14% moisture and below 20°C. Avoid damaging seed during harvest or handling.                                                                                                                                                                                                                                                                                                                                                | difenoconazole + metalaxyl-M                          | Dividend XL RTA  | 325–650 mL/ 100 kg seed | For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 35 days of planting.                                                                                                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | ipconazole                                            | Rancona Apex     | 325 mL/ 100 kg seed     | For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 30 days after planting.                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | tebuconazole + prothioconazole + metalaxyl            | Raxil Pro MD     | 325 mL/ 100 kg seed     | For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provide good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | penflufen + prothioconazole + metalaxyl               | EverGol Energy   | 65 mL/ 100 kg seed      | For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.                                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | difenoconazole + metalaxyl-m + sedaxane + fludioxonil | Vibrance Quattro | 325 mL/ 100 kg seed     | For commercial and on-farm treating. Apply this product utilizing seed treatment equipment that provides uniform seed coverage. Uneven or incomplete seed coverage may not give the desired level of disease control. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                   |
| <b>DWARF BUNT (<i>Tilletia controversa</i>) — SEED AND SOIL-BORNE BUNTS (COMMON, DWARF)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                       |                  |                         |                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                       |                  |                         |                                                                                                                                                                                                                                                                                                                                                                                                     |
| Wheat infected with dwarf bunt will be substantially shorter than healthy plants. Infected seed has a “fishy” smell. Dwarf bunt occurs on winter wheat, primarily in counties bordering Georgian Bay and Lake Huron where snow cover is deep and persistent in late winter and early spring. Plant seed that is free of bunt spores (black). Treat seed when bunt has been observed in the crop. Cut the crop high when harvesting. Raising the header reduces the amount of bunt balls being harvested. Ensure good coverage of fungicide seed treatment on the seed. Avoid planting wheat in fields with soil-borne dwarf bunt for 5–7 yr, since the fungus is very persistent. | difenoconazole + metalaxyl-M                          | Dividend XL RTA  | 325–650 mL/ 100 kg seed | For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 35 days of planting.                                                                                                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | difenoconazole + metalaxyl-M + sedaxane               | Vibrance XL      | 180–360 mL/ 100 kg seed | <b>For use in commercial seed treatment facilities only.</b> For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | carbathiin + thiram                                   | Vitaflo 280      | 230–330 mL/ 100 kg seed | <b>For use in commercial seed treatment facilities only. For control of seed-borne dwarf bunt only.</b> Do not graze or feed livestock on treated areas for 6 weeks after planting.                                                                                                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | difenoconazole + metalaxyl-m + sedaxane + fludioxonil | Vibrance Quattro | 325 mL/ 100 kg seed     | For commercial and on-farm treating. Apply this product utilizing seed treatment equipment that provides uniform seed coverage. Uneven or incomplete seed coverage may not give the desired level of disease control. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                   |

## WHEAT DISEASES

Table 4–10. Chemical Control Options for Seedling Diseases in Wheat — Loose Smut

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Active Ingredient                                     | Trade Name              | Rate                   | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|-------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>LOOSE SMUT (<i>Ustilago tritici</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                       |                         |                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                       |                         |                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| This fungus infects the embryo at flowering, thus is seed-borne. Light rains or heavy dew and moderate temperature, 15°C–16°C, during flowering, favour infection. Use pedigreed seed that is treated with a fungicide seed treatment. This disease was quite important in Ontario wheat production, but the incidence and hence its impact has been reduced substantially due to the effectiveness of fungicide seed treatments. Good coverage of seed with fungicide seed treatment is important. | carbathiin + thiram                                   | Vitaflo 280             | 330 mL/100 kg seed     | <b>For use in commercial seed treatment facilities only.</b> Do not graze or feed livestock on treated areas for 6 weeks after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | tebuconazole + thiram                                 | Raxil T                 | 225 mL/100 kg seed     | For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | tebuconazole + metalaxyl-M                            | Raxil MD                | 300 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provides good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | tebuconazole + prothioconazole + metalaxyl            | Raxil Pro MD            | 325 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provide good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | difenoconazole + metalaxyl-M                          | Dividend XL RTA         | 325–650 mL/100 kg seed | For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 55 days of planting.                                                                                                                                                                                                                                                                                                                                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | difenoconazole + metalaxyl-M + sedaxane               | Vibrance XL             | 180–360 mL/100 kg seed | <b>For use in commercial seed treatment facilities only.</b> For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.                                                                                                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | triticonazole + thiram                                | Gemini                  | 360 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder.                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ipconazole                                            | Rancona Apex            | 325 mL/100 kg seed     | For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 30 days after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | penflufen + prothioconazole + metalaxyl               | EverGol Energy          | 65 mL/100 kg seed      | For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.                                                                                                                                                                                                                                                                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | difenoconazole + metalaxyl-M + sedaxane + fludioxonil | Vibrance Quattro        | 325 mL/100 kg seed     | For commercial and on-farm treating. Apply this product utilizing seed treatment equipment that provides uniform seed coverage. Uneven or incomplete seed coverage may not give the desired level of disease control. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | clothianidin + metalaxyl + metconazole                | NipsIt SUITE Cereals OF | 326 mL/100 kg seed     | For commercial and on-farm treating.<br>Not for use in hopper-box, slurry-box or similar seed treatment applications used at planting. This product is to be used in liquid or slurry treaters. Mix thoroughly before use. Do not make any subsequent application of a Group 4 insecticide (e.g., in-furrow or foliar application) following treatment with NipsIt SUITE Cereals OF seed protectant.<br>NipsIt SUITE Cereals OF seed protectant is a ready-to-use product, which includes red colourant (according to regulations pertaining to the Seeds Act). No additional colourant, dyes, binders, polymers or water are required. |

## WHEAT DISEASES

**Table 4–11.** Chemical Control Options for Seedling Diseases in Wheat — *Fusarium* Crown and Foot Rot, *Rhizoctonia*, Take-All

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                      | Active Ingredient                                     | Trade Name              | Rate                   | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|-------------------------|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>FUSARIUM CROWN and FOOT ROT (<i>Fusarium graminearum</i>, <i>F. culmorum</i>, <i>F. pseudograminearum</i>) — Suppression only</b>                                                                                                                                                                                    |                                                       |                         |                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                   |                                                       |                         |                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Cool, dry soils are favourable for disease development. Delay planting until conditions will result in a rapid and uniform emergence. Avoid planting after corn and maintain good soil fertility.                                                                                                                       | difenoconazole + metalaxyl-M                          | Dividend XL RTA         | 325–650 mL/100 kg seed | <b>Provides suppression only.</b> For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 35 days of planting.                                                                                                                                                                                                                                                                                                                                          |
|                                                                                                                                                                                                                                                                                                                         | ipconazole                                            | Rancona Apex            | 325 mL/100 kg seed     | <b>Provides suppression only.</b> For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 30 days after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                         | tebuconazole + metalaxyl-M                            | Raxil MD                | 300 mL/100 kg seed     | <b>Provides suppression only.</b> For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provides good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                         | difenoconazole + metalaxyl-m + sedaxane + fludioxonil | Vibrance Quattro        | 325 mL/100 kg seed     | For commercial and on-farm treating. Apply this product utilizing seed treatment equipment that provides uniform seed coverage. Uneven or incomplete seed coverage may not give the desired level of disease control. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                                                                                                                                                                                     |
| <b>RHIZOCTONIA (<i>Rhizoctonia solani</i>)</b>                                                                                                                                                                                                                                                                          |                                                       |                         |                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                   |                                                       |                         |                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Rhizoctonia root rot forms reddish-brown, sunken lesions on the stem and taproot, most frequently near the soil line. The lesion can girdle the entire stem, causing stunting or death of the plant. This lesion is distinctively “brick-red” in colour, noticeable immediately after removing the plant from the soil. | difenoconazole + metalaxyl-M + sedaxane               | Vibrance XL             | 180–360 mL/100 kg seed | <b>For use in commercial seed treatment facilities only.</b> For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.                                                                                                                                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                                         | penflufen + prothioconazole + metalaxyl               | EverGol Energy          | 65 mL/100 kg seed      | For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                         | clothianidin + metalaxyl + metconazole                | NipsIt SUITE Cereals OF | 326 mL/100 kg seed     | For commercial and on-farm treating.<br>Not for use in hopper-box, slurry-box or similar seed treatment applications used at planting. This product is to be used in liquid or slurry treaters. Mix thoroughly before use. Do not make any subsequent application of a Group 4 insecticide (e.g., in-furrow or foliar application) following treatment with NipsIt SUITE Cereals OF seed protectant.<br>NipsIt SUITE Cereals OF seed protectant is a ready-to-use product that includes red colourant (according to regulations pertaining to the Seeds Act). No additional colourant, dyes, binders, polymers or water are required. |
|                                                                                                                                                                                                                                                                                                                         | difenoconazole + metalaxyl-m + sedaxane + fludioxonil | Vibrance Quattro        | 325 mL/100 kg seed     | For commercial and on-farm treating. Apply this product utilizing seed treatment equipment that provides uniform seed coverage. Uneven or incomplete seed coverage may not give the desired level of disease control. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                                                                                                                                                                                     |

## WHEAT DISEASES

**Table 4–11.** Chemical Control Options for Seedling Diseases in Wheat — Fusarium Crown and Foot Rot, Rhizoctonia, Take-All

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                          | Active Ingredient                                     | Trade Name       | Rate                   | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|------------------|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>TAKE-ALL (<i>Gaeumannomyces graminis</i>) — Suppression only</b>                                                                                                                                                                                                                                                                                                                                                                         |                                                       |                  |                        |                                                                                                                                                                                                                                                                                                   |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                       |                  |                        |                                                                                                                                                                                                                                                                                                   |
| Carefully manage your soil fertility to manage this disease. Neutral-to-alkaline and infertile soils are most at risk. Do not apply lime before planting. Potassium and phosphorus deficiencies in the soil cause plants to be more susceptible because of poor root development. Nitrate nitrogen increases disease severity. Control grass weeds and avoid early planting. Use a 3-yr crop rotation and avoid planting wheat after wheat. | difenoconazole + metalaxyl-M                          | Dividend XL RTA  | 325–650 mL/100 kg seed | <b>Provides suppression only.</b> For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 55 days of planting.      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                             | difenoconazole + metalaxyl-m + sedaxane + fludioxonil | Vibrance Quattro | 325 mL/100 kg seed     | For commercial and on-farm treating. Apply this product utilizing seed treatment equipment that provides uniform seed coverage. Uneven or incomplete seed coverage may not give the desired level of disease control. Do not graze or feed livestock on treated areas for 45 days after planting. |

## WHEAT DISEASES

Table 4-12. Chemical Control Options for Seedling Diseases in Wheat — Common Bunt

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                         | Active Ingredient                                     | Trade Name              | Rate                   | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|-------------------------|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>COMMON BUNT (<i>Tilletia tritici</i> and <i>Tilletia laevis</i>) — Seed and soil-borne bunts (common, dwarf)</b>                                                                                                                                                                                                                        |                                                       |                         |                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                                      |                                                       |                         |                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Cool soil temperatures after seeding favour this disease. This disease was quite important in Ontario wheat production, but the incidence and hence its impact has been reduced substantially due to the effectiveness of fungicide seed treatments. Use seed that is free of bunt spores (black). Infected seed produces a “fishy” smell. | carbathiin + thiram                                   | Vitaflo 280             | 230–330 mL/100 kg seed | Do not graze or feed livestock on treated areas for 6 weeks after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                                                                                                                                                                                                                                                                                                            | difenoconazole + metalaxyl-M                          | Dividend XL RTA         | 325–650 mL/100 kg seed | Controls both seed- and soil-borne common bunt. For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 55 days of planting.                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                            | difenoconazole + metalaxyl-M + sedaxane               | Vibrance XL             | 180–360 mL/100 kg seed | <b>For use in commercial seed treatment facilities only.</b> For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.                                                                                                                                                                                                                                                                                                         |
|                                                                                                                                                                                                                                                                                                                                            | tebuconazole + thiram                                 | Raxil T                 | 225 mL/100 kg seed     | For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                                                                                                                                                                                                                                                                                                                            | tebuconazole + metalaxyl-M                            | Raxil MD                | 300 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provides good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                                                                                                                                                                                                      |
|                                                                                                                                                                                                                                                                                                                                            | tebuconazole + prothioconazole + metalaxyl            | Raxil Pro MD            | 325 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provide good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                                                                                                                                            | triticonazole + thiram                                | Gemini                  | 360 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder.                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                            | ipconazole                                            | Rancona Apex            | 325 mL/100 kg seed     | For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 30 days after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                                                                                                                                                                                                                                                                                                                            | difenoconazole + metalaxyl-m + sedaxane + fludioxonil | Vibrance Quattro        | 325 mL/100 kg seed     | For commercial and on-farm treating. Apply this product utilizing seed treatment equipment that provides uniform seed coverage. Uneven or incomplete seed coverage may not give the desired level of disease control. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                                                                                                                                                                                         |
|                                                                                                                                                                                                                                                                                                                                            | clothianidin + metalaxyl + metconazole                | NipsIt SUITE Cereals OF | 326 mL/100 kg seed     | For commercial and on-farm treating.<br>Not for use in hopper-box, slurry-box or similar seed treatment applications used at planting. This product is to be used in liquid or slurry treaters. Mix thoroughly before use. Do not make any subsequent application of a Group 4 insecticide (e.g., in-furrow or foliar application) following treatment with NipsIt SUITE Cereals OF seed protectant.<br><br>NipsIt SUITE Cereals OF seed protectant is a ready-to-use product that includes red colourant (according to regulations pertaining to the Seeds Act). No additional colourant, dyes, binders, polymers or water are required. |

## WHEAT DISEASES

**Table 4–13.** Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Early-Season Septoria, Spot Blotch  
See Appendix H. Cereal Growth Stages, on page 193.

| <b>LEGEND:</b> PHI = Pre-Harvest Interval (in days)                                                                                                                                      |                              | N/A = not applicable |                                    |                                        |                                                                                                                                                                                                                                                                                                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|----------------------|------------------------------------|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Integrated Pest Management Options</b>                                                                                                                                                | <b>Active Ingredient</b>     | <b>Trade Name</b>    | <b>Rate</b>                        | <b>PHI</b>                             | <b>Comments (label precautions, re-entry periods, etc.)</b>                                                                                                                                                                                                                                                                                                           |
| <b>EARLY-SEASON SEPTORIA (<i>Septoria</i> spp.)</b>                                                                                                                                      |                              |                      |                                    |                                        |                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Seed Treatment</b>                                                                                                                                                                    |                              |                      |                                    |                                        |                                                                                                                                                                                                                                                                                                                                                                       |
| Early-season septoria control may reduce the risk of later infection. However, if the flag leaf is disease-free at the time of head emergence, a fungicide will not likely be necessary. | difenoconazole + metalaxyl-M | Dividend XL RTA      | 650 mL/<br>100 kg seed             | N/A                                    | Provides control for the first 6 weeks after planting. For full-season control, apply a foliar fungicide. For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeders. Do not graze, feed green forage or cut for hay within 55 days of planting. |
| <b>SPOT BLOTCH (<i>Cochliobolus sativus</i>)</b>                                                                                                                                         |                              |                      |                                    |                                        |                                                                                                                                                                                                                                                                                                                                                                       |
| Avoid growing wheat after barley, wheat or grasses in a rotation. Removal of residue/ straw will lower risk.                                                                             | pyraclostrobin + metconazole | Twinline             | 380–500 mL/ha<br>(150–200 mL/acre) | Do not apply at boot stage and beyond. | Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Ensure thorough coverage of foliage. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 6-day re-entry period.                            |

## WHEAT DISEASES

**Table 4–14.** Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Septoria Leaf Spot  
See Appendix H. Cereal Growth Stages, on page 193.

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                        | Active Ingredient            | Trade Name     | Rate                               | PHI                                    | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|----------------|------------------------------------|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SEPTORIA LEAF SPOT (<i>Septoria tritici</i>)</b>                                                                                                                                                                                                                                                                                                                                                       |                              |                |                                    |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Foliar Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                   |                              |                |                                    |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Wet, windy weather and moderate temperatures favour the development of this disease. Destroying volunteer wheat, reducing crop residue and crop rotation can help reduce risk of infection. Plant less susceptible varieties. Consult with your seed company and the Ontario Cereal Crops Committee Variety Trial Results at <a href="http://www.gocereals.ca">www.gocereals.ca</a> for variety profiles. | pyraclostrobin               | Headline EC    | 300–600 mL/ha<br>(120–240 mL/acre) | Do not apply at boot stage and beyond. | Ground and aerial application. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                           | azoxystrobin + propiconazole | Quilt          | 750 mL/ha<br>(305 mL/acre)         | Do not apply at boot stage and beyond. | Ground and aerial application. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 1 application/yr. Do not harvest for forage. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                           | propiconazole                | Tilt 250 E     | 250–500 mL/ha<br>(100–200 mL/acre) | 45                                     | Ground and aerial application. Early application at Zadok's 12–23. Use low rate for early-season disease suppression. Use higher rate for fields with high disease pressure history or field conditions favourable for disease development. Later application at first sign of disease (Zadok's 29–37) or before head is half emerged (Zadok's 49–55). Apply only the high rate on any application from Zadok's 29–55. Maximum 2 applications/yr.                                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                           |                              | Bumper 418 EC  | 150–300 mL/ha<br>(60–121 mL/acre)  | 45                                     | Ground and aerial application. For early-season disease suppression, use the lower rate at Zadok's 12–23 (as early as the two-leaf stage). Use the high rate for fields with a history of disease pressure. For later-season application, apply at early signs of disease from the beginning of stem elongation (Zadok's 29–37). If conditions favourable to disease continue, apply again, if necessary, before head is half emerged (Zadok's 49–55). Apply only the high rate from Zadok's 29–55. Maximum 2 applications/yr. |
|                                                                                                                                                                                                                                                                                                                                                                                                           | prothioconazole              | Proline 480 SC | 315 mL/ha<br>(128 mL/acre)         | 30                                     | Ground and aerial application. Use as a preventive when earliest disease symptoms appear on the leaves and stems. Use with the registered non-ionic surfactant, Agral 90 or AgSurf at 0.125% vol/vol. Minimum 7-day interval between applications. Maximum 2 applications/yr. 24-hr re-entry period.                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                           | azoxystrobin + propiconazole | Blanket AP     | 200–300 mL/ha<br>(80–120 mL/acre)  | Do not apply at boot stage and beyond. | For commercial and on-farm treating. Apply once between stem elongation and half-head emergence. Good spray coverage and canopy penetration are important for best results.                                                                                                                                                                                                                                                                                                                                                    |

## WHEAT DISEASES

**Table 4–14.** Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Septoria Leaf Spot  
See Appendix H. Cereal Growth Stages, on page 193.

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                           | Active Ingredient              | Trade Name     | Rate                             | PHI                                    | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------------------|--------------------------------|----------------|----------------------------------|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SEPTORIA LEAF SPOT (<i>Septoria tritici</i>) (cont'd)</b> |                                |                |                                  |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Foliar Treatment (cont'd)</b>                             |                                |                |                                  |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| (cont'd)                                                     | prothioconazole + tebuconazole | Prosaro 250 EC | 800 mL/ha (324 mL/acre)          | 36                                     | Ground and aerial application. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                                              | tebuconazole                   | Folicur 250 EW | 375–500 mL/ha (152–200 mL/acre)  | 36                                     | Ground and aerial application. Apply to leaf foliage at very early stage of disease, especially if weather conditions are conducive to disease development, up to the end of the flowering stage. Use the higher rate when weather conditions are conducive to heavy disease development. The use of a non-ionic surfactant (Agral 90 or Agsurf) is NOT required, as it is built into the formulation. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.<br><br>Before using Folicur for control of wheat leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence. |
|                                                              |                                | Folicur 432 F  | 220–292 mL/ha (90–118 mL/acre)   | 36                                     | Ground and aerial application. Apply to leaf foliage at the first sign or very early stage of disease, especially if weather conditions are conducive to disease development, up to the end of the flowering stage. Use the higher rate when weather conditions are conducive to heavy disease development. Always use non-ionic surfactant such as Agral 90 or Agsurf at 0.125% vol/vol. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.<br><br>Before using Folicur for control of wheat leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.              |
|                                                              | picoxystrobin                  | Acapela        | 0.44–0.88 L/ha (180–350 mL/acre) | Do not apply at boot stage and beyond. | Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Use high rate and shorter interval when disease pressure is high. Optimum protection of flag leaf is provided when applied at “flag leaf out” (Zadok’s 39). Do not apply after flowering (Zadok’s 59). Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha/season. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                        |

## WHEAT DISEASES

**Table 4–14.** Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Septoria Leaf Spot  
See Appendix H. Cereal Growth Stages, on page 193.

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                           | Active Ingredient                 | Trade Name               | Rate                                                                 | PHI                                    | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------------------------------------|-----------------------------------|--------------------------|----------------------------------------------------------------------|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SEPTORIA LEAF SPOT (<i>Septoria tritici</i>) (cont'd)</b> |                                   |                          |                                                                      |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Foliar Treatment (cont'd)</b>                             |                                   |                          |                                                                      |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| (cont'd)                                                     | penthiopyrad                      | Vertisan                 | 1.2–1.75 L/ha<br>(0.48–0.7 L/acre)                                   | Do not apply at boot stage and beyond. | <b>Suppression only.</b> Ground and aerial application. Begin applications prior to disease development and continue on a 7–14-day interval. Use higher rate and shorter interval when disease pressure is high. To optimize flag leaf protection, apply at “flag leaf out” (Zadok’s 39). Do not apply after flowering (Zadok’s 59). Do not apply more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 3.5 L/ha/yr. 12-hr re-entry period. |
|                                                              | mancozeb                          | Dithane DG Rainshield NT | early: 1.1 kg/ha<br>(440 g/acre)<br>late: 2.25 kg/ha<br>(900 g/acre) | 40                                     | Ground and aerial application. Use lower rate for applications at Zadok’s 12–21 growth stage, when crop is in 3rd leaf to tillering. Higher rate for applications at Zadok’s 59 growth stage when head is fully emerged but prior to flowering. Do not graze crop or cut for hay. Maximum 2 applications/yr.                                                                                                                                                                                       |
|                                                              | trifloxystrobin + prothioconazole | Stratego Pro             | 440 mL/ha<br>(178 mL/acre)                                           | Do not apply at boot stage and beyond. | Ground and aerial application. Apply Stratego Pro as a preventive disease control measure. Stratego Pro may be tank-mixed with either Buctril M or Infinity herbicides only during the 2- to 4-leaf stage in the fall or from the time growth commences in the spring to the early flag leaf stage. Do not tank-mix Stratego Pro with graminicide herbicides.                                                                                                                                      |
|                                                              | azoxystrobin + propiconazole      | Quilt                    | 0.5–1.0 L/ha<br>(202–406 mL/acre)                                    | Do not apply at boot stage and beyond. | Ground and aerial application. Apply at first sign of disease starting at the 2-leaf stage and up to the flag leaf fully emerged stage. Do not apply at boot stage and beyond. Where a rate range is indicated, use the higher rate if there is a history of high disease pressure in the field or if field conditions favour disease development. 12-hr re-entry period. Maximum 2 applications/yr.                                                                                               |
|                                                              | pyraclostrobin + fluxapyroxad     | Priaxor                  | 0.225–0.3 L/ha<br>(90–120 mL/acre)                                   | Do not apply at boot stage and beyond. | Ground and aerial application. For optimal disease control, begin applications prior to disease development at the onset of disease symptoms. Applications should be made prior to head emergence. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                       |

## WHEAT DISEASES

**Table 4–15.** Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Powdery Mildew  
See Appendix H. Cereal Growth Stages, on page 193.

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Active Ingredient              | Trade Name     | Rate                                | PHI                                    | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|----------------|-------------------------------------|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>POWDERY MILDEW (<i>Erysiphe graminis</i> f. sp. <i>tritici</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                |                |                                     |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                |                |                                     |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| The fungus is very susceptible to weather conditions that promote drying of the crop environment, such as hot, dry, sunny weather. Management includes the use of tolerant varieties, crop rotation, tillage and fungicides. Consult with your seed company and the Ontario Cereal Crops Committee Variety Trial Results at <a href="http://www.gocereals.ca">www.gocereals.ca</a> for variety profiles. See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , for thresholds and more information.                                                                                                                                                                                                                      |                                |                |                                     |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Foliar Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                |                |                                     |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Foliar fungicide applications may be necessary if disease levels will result in yield losses and/or a susceptible variety has been used. Consult with your seed company and the Ontario Cereal Crops Committee Variety Trial Results at <a href="http://www.gocereals.ca">www.gocereals.ca</a> for variety profiles. Thresholds for fungicide applications differ, depending on the age of the crop. If 5%–10% of the lower leaves are infested early in the season, control is warranted. This may limit later infection. Later in the season, powdery mildew symptoms on the flag leaf (1% of the leaf) and the second leaf (3%–5% of the leaf) require immediate attention, especially if prolonged wet, humid weather is forecast. | pyraclostrobin                 | Headline EC    | 400–600 mL/ha<br>(160–240 mL/acre)  | Do not apply at boot stage and beyond. | Ground and aerial application. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | propiconazole                  | Tilt 250 E     | 500 mL/ha<br>(200 mL/acre)          | 45                                     | Ground and aerial application. Apply at early signs of disease from the beginning of stem elongation (Zadok's 29–37). If conditions favourable to disease continue, apply a second spray before the head is half emerged (Zadok's 49–55). Can be tank-mixed with several cereal herbicides. Maximum 2 applications/yr.                                                                                                                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                | Bumper 418 EC  | 300 mL/ha<br>(121 mL/acre)          |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | picoxystrobin                  | Acapela        | 0.44–0.88 L/ha<br>(180–350 mL/acre) | Do not apply at boot stage and beyond. | Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Use high rate and shorter interval when disease pressure is high. Optimum protection of flag leaf is provided when applied at “flag leaf out” (Zadok's 39). Do not apply after flowering (Zadok's 59). Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha/season. 12-hr re-entry period. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | prothioconazole + tebuconazole | Prosaro 250 EC | 800 mL/ha<br>(324 mL/acre)          | 36                                     | Ground and aerial application. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | pyraclostrobin + metconazole   | Twinline       | 380–500 mL/ha<br>(150–200 mL/acre)  | Do not apply at boot stage and beyond. | Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Ensure thorough coverage of foliage. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 6-day re-entry period.                                                                                                                                   |

## WHEAT DISEASES

**Table 4–15.** Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Powdery Mildew  
See Appendix H. Cereal Growth Stages, on page 193.

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                              | Active Ingredient                 | Trade Name      | Rate                            | PHI                                    | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------------------------------------------------------------------------|-----------------------------------|-----------------|---------------------------------|----------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>POWDERY MILDEW (<i>Erysiphe graminis</i> f. sp. <i>tritici</i>) (cont'd)</b> |                                   |                 |                                 |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Foliar Treatment (cont'd)</b>                                                |                                   |                 |                                 |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| (cont'd)                                                                        | tebuconazole                      | Folicur 250 EW  | 500 mL/ha (200 mL/acre)         | 36                                     | Ground and aerial application. Apply to leaf foliage at the first sign or very early stage of disease, especially if weather conditions are conducive to disease development, up to the end of the flowering stage. The use of a non-ionic surfactant (Agral 90 or Agsurf) is <b>NOT</b> required as it is built into the formulation. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.<br><br>Before using Folicur for control of wheat leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.                                  |
|                                                                                 |                                   | Folicur 432 F   | 292 mL/ha (118 mL/acre)         | 36                                     | Ground and aerial application. Apply to leaf foliage at the first sign or very early stage of disease, especially if weather conditions are conducive to disease development, up to the end of the flowering stage. Use the higher rate when weather conditions are conducive to heavy disease development. Use non-ionic surfactant such as Agral 90 or Agsurf at 0.125% vol/vol. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.<br><br>Before using Folicur for wheat leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence. |
|                                                                                 | trifloxystrobin + propiconazole   | Stratego 250 EC | 500 mL/ha (200 mL/acre)         | Do not apply at boot stage and beyond. | Ground and aerial application. Do not apply the second application within 14 days of the first. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Can be tank-mixed with Buctril M in wheat. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                                                 | trifloxystrobin + prothioconazole | Stratego Pro    | 440 mL/ha (178 mL/acre)         | Do not apply at boot stage and beyond. | Ground and aerial application. Apply Stratego Pro as a preventive disease control measure or at the very early stages of disease development. Do not apply after early heading (the head is half emerged). Stratego Pro may be tank-mixed with either Buctril M or Infinity herbicides only during the 2- to 4-leaf stage in the fall or from the time growth commences in the spring to the early flag leaf stage. Do not tank-mix Stratego Pro with graminicide herbicides.                                                                                                                                                                                                                                                                                        |
|                                                                                 | pyraclostrobin + fluxapyroxad     | Priaxor         | 0.225–0.3 L/ha (90–120 mL/acre) | Do not apply at boot stage and beyond. | Ground and aerial application. For optimal disease control, begin applications prior to disease development at the onset of disease symptoms. Applications should be made prior to head emergence. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                                         |

## WHEAT DISEASES

**Table 4–16.** Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Leaf Rust, Stem Rust  
See Appendix H. Cereal Growth Stages, on page 193.

| <b>LEGEND:</b> PHI = Pre-Harvest Interval (in days)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                |                   |                                 |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-------------------|---------------------------------|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Integrated Pest Management Options</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Active Ingredient</b>       | <b>Trade Name</b> | <b>Rate</b>                     | <b>PHI</b>                             | <b>Comments (label precautions, re-entry periods, etc.)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>RUST (LEAF — <i>Puccinia triticina</i> and STEM — <i>P. graminis</i> f. sp. <i>tritici</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                |                   |                                 |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <p>Leaf rust blows in from the southern U.S. late in the season. Minimize stem rust by removing its alternate host, common barberry. Use tolerant or resistant varieties to reduce risk of disease. There are many different phenotypes (races), and wheat varieties vary in their resistance/tolerance. The development of new races could result in a once-resistant variety becoming susceptible over time. Consult with your seed company and the Ontario Cereal Crops Committee Variety Trial Results at <a href="http://www.gocereals.ca">www.gocereals.ca</a> for variety profiles. Use foliar treatments when flag leaf has 5–10 pustules (1% leaf area).</p> | azoxystrobin + propiconazole   | Blanket AP        | 200–300 mL/ha (80–120 mL/acre)  | Do not apply at boot stage and beyond. | For commercial and on-farm treating. Apply once between stem elongation and half-head emergence. Good spray coverage and canopy penetration are important for best results.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | tebuconazole                   | Folicur 250 EW    | 375–500 mL/ha (152–200 mL/acre) | 36                                     | Ground and aerial application. Apply to leaf foliage at the first sign or very early stage of disease, especially if weather conditions are conducive to disease development, up to the end of the flowering stage. Use the higher rate when weather conditions are conducive to heavy disease development. The use of a non-ionic surfactant (Agral 90 or Agsurf) is <b>NOT</b> required as it is built into the formulation. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.<br><br>Before using Folicur for wheat leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                | Folicur 432 F     | 220–292 mL/ha (90–118 mL/acre)  | 36                                     | Ground and aerial application. Apply to leaf foliage at very early stage of disease, especially if weather conditions are conducive to disease development, up to the end of the flowering stage. Use the higher rate when weather conditions are conducive to heavy disease development. Use non-ionic surfactant such as Agral 90 or Agsurf at 0.125% vol/vol. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.<br><br>Before using Folicur for wheat leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.                                                               |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | prothioconazole + tebuconazole | Prosaro 250 EC    | 800 mL/ha (324 mL/acre)         | 36                                     | Ground and aerial application. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | pyraclostrobin                 | Headline EC       | 300–600 mL/ha (121–240 mL/acre) | Do not apply at boot stage and beyond. | <b>For leaf rust control only.</b> Ground and aerial application. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | azoxystrobin + propiconazole   | Quilt             | 0.75–1.0 L/ha (305–406 mL/acre) | Do not apply at boot stage and beyond. | Ground and aerial application. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. When expecting high disease pressure from stripe rust and wheat leaf rust, use the higher application rate of 1 L/ha. Do not harvest for forage. Maximum 1 application/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

## WHEAT DISEASES

**Table 4–16.** Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Leaf Rust, Stem Rust  
See Appendix H. Cereal Growth Stages, on page 193.

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                          | Active Ingredient               | Trade Name               | Rate                                                                 | PHI                                    | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                               |
|-------------------------------------------------------------------------------------------------------------|---------------------------------|--------------------------|----------------------------------------------------------------------|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>RUST (LEAF — <i>Puccinia triticina</i> and STEM — <i>P. graminis</i> f. sp. <i>tritici</i>) (cont'd)</b> |                                 |                          |                                                                      |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| (cont'd)                                                                                                    | pyraclostrobin + metconazole    | Twinline                 | 380–500 mL/ha<br>(150–200 mL/acre)                                   | Do not apply at boot stage and beyond. | Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Ensure thorough coverage of foliage. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 6-day re-entry period.                                                                                                                                         |
|                                                                                                             | picoxystrobin                   | Acapela                  | 0.44–0.88 L/ha<br>(180–350 mL/acre)                                  | Do not apply at boot stage and beyond. | Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Use high rate and shorter interval when disease pressure is high. Optimum protection of flag leaf is provided when applied at “flag leaf out” (Zadok’s 39). Do not apply after flowering (Zadok’s 59). Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha/season. 12-hr re-entry period.       |
|                                                                                                             | penthiopyrad                    | Vertisan                 | 1.2–1.75 L/ha<br>(0.48–0.7 L/acre)                                   | Do not apply at boot stage and beyond. | Ground and aerial application. Begin applications prior to disease development and continue on a 7–14-day interval. Use higher rate and shorter interval when disease pressure is high. To optimize flag leaf protection, apply at “flag leaf out” (Zadok’s 39). Do not apply at boot stage (Zadok’s 47) and beyond. Do not apply more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 3.5 L/ha/yr. 12-hr re-entry period. |
|                                                                                                             | propiconazole                   | Tilt 250 E               | 500 mL/ha<br>(200 mL/acre)                                           | 45                                     | Ground and aerial application. Apply at early signs of disease from the beginning of stem elongation (Zadok’s 29–37). If conditions favourable to disease continue, apply again, if necessary, before head is half emerged (Zadok’s 49–55). Can be tank-mixed with several cereal herbicides. Maximum 2 applications/yr.                                                                                                                                                           |
|                                                                                                             |                                 | Bumper 418 EC            | 300 mL/ha<br>(121 mL/acre)                                           |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                                                                             | prothioconazole                 | Proline 480 SC           | 315 mL/ha<br>(128 mL/acre)                                           | 30                                     | Ground and aerial application. Use as a preventive when earliest disease symptoms appear on the leaves and stems. Use with the registered non-ionic surfactant, Agral 90 or AgSurf at 0.125% vol/vol. Minimum 7-day interval between applications. Maximum 2 applications/yr. 24-hr re-entry period.                                                                                                                                                                               |
|                                                                                                             | trifloxystrobin + propiconazole | Stratego 250 EC          | 500 mL/ha<br>(200 mL/acre)                                           | Do not apply at boot stage and beyond. | Ground and aerial application. Do not apply the second application within 14 days of the first. Apply only up to flag leaf fully emerged stage (Zadok’s 39). Do not apply at boot stage (Zadok’s 47) and beyond. Can be tank-mixed with Buctril M in wheat. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                      |
|                                                                                                             | mancozeb                        | Dithane DG Rainshield NT | early: 1.1 kg/ha<br>(440 g/acre)<br>late: 2.25 kg/ha<br>(900 g/acre) | 40                                     | <b>For leaf rust control only.</b> Ground and aerial application. Use lower rate for applications at Zadok’s 12–21 growth stage, when crop is in 3rd leaf to tillering. Higher rate for applications at Zadok’s 59 growth stage when head is fully emerged but prior to flowering. Do not graze crop or cut for hay. Maximum 2 applications/yr.                                                                                                                                    |
|                                                                                                             | pyraclostrobin + fluxapyroxad   | Priaxor                  | 0.225–0.3 L/ha<br>(90–120 mL/acre)                                   | Do not apply at boot stage and beyond. | Ground and aerial application. For optimal disease control, begin applications prior to disease development at the onset of disease symptoms. Applications should be made prior to head emergence. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                       |

## WHEAT DISEASES

**Table 4–17.** Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Tan Spot  
See Appendix H. Cereal Growth Stages, on page 193.

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                | Active Ingredient            | Trade Name    | Rate                             | PHI                                    | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|---------------|----------------------------------|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>TAN SPOT (<i>Pyrenophora tritici-repentis</i>)</b>                                                                                                                                                             |                              |               |                                  |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Foliar Treatment</b>                                                                                                                                                                                           |                              |               |                                  |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Reduced tillage and cool, cloudy, humid weather promote this disease. Tan spot survives in crop residues. Avoid planting wheat in conservation tillage fields in which wheat was grown during the preceding 2 yr. | azoxystrobin + propiconazole | Quilt         | 750 mL/ha (305 mL/acre)          | Do not apply at boot stage and beyond. | Ground and aerial application. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Do not harvest for forage. Maximum 1 application/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                    |
|                                                                                                                                                                                                                   |                              | Blanket AP    | 200–300 mL/ha (80–120 mL/acre)   | Do not apply at boot stage and beyond. | For commercial and on-farm treating. Apply once up to boot stage. Good spray coverage and canopy penetration are important for best results.                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                   | pyraclostrobin               | Headline EC   | 300–600 mL/ha (121–240 mL/acre)  | Do not apply at boot stage and beyond. | Ground and aerial application. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                              |
|                                                                                                                                                                                                                   | picoxystrobin                | Acapela       | 0.44–0.88 L/ha (180–350 mL/acre) | Do not apply at boot stage and beyond. | Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Use high rate and shorter interval when disease pressure is high. Optimum protection of flag leaf is provided when applied at “flag leaf out” (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha/season. 12-hr re-entry period.                                          |
|                                                                                                                                                                                                                   | propiconazole                | Tilt 250 E    | 250–500 mL/ha (100–200 mL/acre)  | 45                                     | Ground and aerial application. Early application at Zadok's 12–23. Use low rate for early-season disease suppression. Use higher rate for fields with high disease pressure history or field conditions favourable for disease development. Later application at first sign of disease (Zadok's 29–37) or before head is half emerged (Zadok's 49–55). Apply only the high rate on any application from Zadok's 29–55. Maximum 2 applications/yr.                                                                              |
|                                                                                                                                                                                                                   |                              | Bumper 418 EC | 150–300 mL/ha (60–121 mL/acre)   | 45                                     | Ground and aerial application. For early-season disease suppression, use the lower rate at Zadok's 12–23 (as early as the two-leaf stage). Use the high rate for fields with a history of disease pressure. For later-season application, apply at early signs of disease from the beginning of stem elongation (Zadok's 29–37). If conditions favourable to disease continue, apply again, if necessary, before head is half emerged (Zadok's 49–55). Apply only the high rate from Zadok's 29–55. Maximum 2 applications/yr. |

## WHEAT DISEASES

**Table 4–17.** Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Tan Spot  
See Appendix H. Cereal Growth Stages, on page 193.

| <b>LEGEND:</b> PHI = Pre-Harvest Interval (in days)            |                                    |                    |                                    |                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|----------------------------------------------------------------|------------------------------------|--------------------|------------------------------------|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Integrated Pest Management Options</b>                      | <b>Active Ingredient</b>           | <b>Trade Name</b>  | <b>Rate</b>                        | <b>PHI</b>                                         | <b>Comments (label precautions, re-entry periods, etc.)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>TAN SPOT (<i>Pyrenophora tritici-repentis</i>) (cont'd)</b> |                                    |                    |                                    |                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| (cont'd)                                                       | prothioconazole                    | Proline 480 SC     | 315 mL/ha<br>(128 mL/acre)         | 30                                                 | Ground and aerial application. Use as a preventive when earliest disease symptoms appear on the leaves and stems. Use with the registered non-ionic surfactant, Agral 90 or AgSurf at 0.125% vol/vol. Minimum 7-day interval between applications. Maximum 2 applications/yr. 24-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                                                | tebuconazole                       | Folicur 250 EW     | 375–500 mL/ha<br>(152–200 mL/acre) | 36                                                 | Ground and aerial application. Apply to leaf foliage at the first sign or very early stage of disease, especially if weather conditions are conducive to disease development, up to the end of the flowering stage. Use the higher rate when weather conditions are conducive to heavy disease development. The use of a non-ionic surfactant (Agral 90 or Agsurf) is <b>NOT</b> required as it is built into the formulation. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.<br><br>Before using Folicur for wheat leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence. |
|                                                                |                                    | Folicur 432 F      | 220–292 mL/ha<br>(90–118 mL/acre)  | 36                                                 | Ground and aerial application. Apply to leaf foliage at the first sign or very early stage of disease, especially if weather conditions are conducive to disease development, up to the end of the flowering stage. Use the higher rate when weather conditions are conducive to heavy disease development. Use non-ionic surfactant such as Agral 90 or Agsurf at 0.125% vol/vol. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.<br><br>Before using Folicur for wheat leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.                                             |
|                                                                | trifloxystrobin<br>+ propiconazole | Stratego<br>250 EC | 500 mL/ha<br>(200 mL/acre)         | Do not<br>apply<br>at boot<br>stage and<br>beyond. | Ground and aerial application. Do not apply the second application within 14 days of the first. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Can be tank-mixed with Buctril M in wheat. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

## WHEAT DISEASES

**Table 4–17.** Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Tan Spot  
See Appendix H. Cereal Growth Stages, on page 193.

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                             | Active Ingredient                 | Trade Name                  | Rate                                                                     | PHI                                                | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------------------------------------|-----------------------------------|-----------------------------|--------------------------------------------------------------------------|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>TAN SPOT (<i>Pyrenophora tritici-repentis</i>) (cont'd)</b> |                                   |                             |                                                                          |                                                    |                                                                                                                                                                                                                                                                                                                                                                                                      |
| (cont'd)                                                       | mancozeb                          | Dithane DG<br>Rainshield NT | early: 1.1 kg/ha<br>(440 g/acre)<br><br>late: 2.25 kg/ha<br>(900 g/acre) | 40                                                 | Ground and aerial application. Use lower rate for applications at Zadok's 12–21 growth stage, when crop is in 3rd leaf to tillering. Higher rate for applications at Zadok's 59 growth stage when head is fully emerged but prior to flowering. Do not graze crop or cut for hay. Maximum 2 applications/yr.                                                                                         |
|                                                                | prothioconazole<br>+ tebuconazole | Prosaro 250 EC              | 800 mL/ha<br>(324 mL/acre)                                               | 36                                                 | Ground and aerial application. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.                                                                                                                                                                                                                  |
|                                                                | pyraclostrobin<br>+ metconazole   | Twinline                    | 380–500 mL/ha<br>(150–200 mL/acre)                                       | Do not<br>apply<br>at boot<br>stage and<br>beyond. | Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Ensure thorough coverage of foliage. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 6-day re-entry period.                                                           |
|                                                                | azoxystrobin<br>+ propiconazole   | Quilt                       | 0.5–1.0 L/ha<br>(202–406 mL/acre)                                        | Do not<br>apply<br>at boot<br>stage and<br>beyond. | Ground and aerial application. Apply at first sign of disease starting at the 2-leaf stage and up to the flag leaf fully emerged stage. Do not apply at boot stage and beyond. Where a rate range is indicated, use the higher rate if there is a history of high disease pressure in the field or if field conditions favour disease development. 12-hr re-entry period. Maximum 2 applications/yr. |
|                                                                | pyraclostrobin<br>+ fluxapyroxad  | Priaxor                     | 0.225–0.3 L/ha<br>(90–120 mL/acre)                                       | Do not<br>apply<br>at boot<br>stage and<br>beyond. | Ground and aerial application. For optimal disease control, begin applications prior to disease development at the onset of disease symptoms. Applications should be made prior to head emergence. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 12-hr re-entry period.                                                                         |

## WHEAT DISEASES

**Table 4–18.** Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Fusarium Head Blight  
See Appendix H. Cereal Growth Stages, on page 193.

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Active Ingredient                 | Trade Name        | Rate                               | PHI                                                | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-------------------|------------------------------------|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>FUSARIUM HEAD BLIGHT (<i>Fusarium graminearum</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                   |                   |                                    |                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Warm and prolonged wet conditions during flowering are necessary for infection to occur. Avoid planting into corn stubble, since the fungus also causes gibberella stalk rot in corn. Follow soybeans with wheat in the rotation. See the <i>Fusarium</i> forecasting web page at <a href="http://www.weathercentral.ca/register.cfm">www.weathercentral.ca/register.cfm</a> to determine the fusarium head blight risk for your area and for current recommendations. Consult your local crop advisor for forecast information. | metconazole                       | Caramba           | 0.5–1 L/ha<br>(200–400 mL/acre)    | 30                                                 | Ground and aerial application. <b>For foliar diseases only.</b> Apply to leaf foliage at the first sign or very early stage of disease up to the end of the flowering stage. Use the higher rate when weather conditions are conducive to heavy disease development. Use highest rate (1.0 L/ha (400 mL/acre)) at flowering when targeting FHB (suppression only) and leaf disease control. Use a minimum of 100 L/ha of water for ground application and 50 L/ha of water for aerial application. Maximum 1 application/yr. 5-day re-entry.                                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | prothioconazole<br>+ tebuconazole | Prosaro<br>250 EC | 800 mL/ha<br>(324 mL/acre)         | 36                                                 | <b>Provides suppression only.</b> Ground and aerial application. Timing of application is critical. Apply as a preventive spray within the time period from when at least 75% of the wheat head on the main stem is fully emerged (Zadok's 59) to when 50% of the heads on the main stem are in flower (Zadok's 65). Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | prothioconazole                   | Proline<br>480 SC | 315–420 mL/ha<br>(128–170 mL/acre) | 30                                                 | <b>Provides suppression only.</b> Ground and aerial application. Timing of application is critical. Apply from when at least 75% of the wheat heads on main stem are fully emerged (Zadok's 59) to when 50% of the heads on the main stem are in flower (Zadok's 65). Use with the registered non-ionic surfactant, Agral 90 or AgSurf at 0.125% vol/vol. Maximum 2 applications/yr (735 mL/ha) with a minimum 7-day interval between applications. 24-hr re-entry period.                                                                                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | tebuconazole                      | Folicur<br>250 EW | 500 mL/ha<br>(200 mL/acre)         | 36                                                 | <b>Provides suppression only.</b> Ground and aerial application. Timing of application is critical. The optimum window for application is 1–4 days after 75% of the heads have emerged or cleared the head (Day 0). Apply at the very early stages of disease development. Use higher rate when disease pressure is severe. The use of a non-ionic surfactant (Agral 90 or Agsurf) is <b>NOT</b> required as it is built into the formulation. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                   | Folicur<br>432 F  | 292 mL/ha<br>(118 mL/acre)         | 36                                                 | <b>Provides suppression only.</b> Ground and aerial application. Timing of application is critical. The optimum window for application is 1–4 days after 75% of the heads have emerged or cleared the head (Day 0). Ensure thorough coverage of all wheat heads. Use with the registered non-ionic surfactant, Agral 90 or AgSurf at 0.125% vol/vol. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | pyraclostrobin<br>+ metconazole   | Twinline          | 500–700 mL/ha<br>(200–280 mL/acre) | Do not<br>apply<br>at boot<br>stage and<br>beyond. | Ground and aerial application. <b>For foliar diseases only,</b> so apply to leaf foliage at the first sign or very early stage of disease up to the boot stage. Use the higher rate to obtain extended protection and maximum yield benefits. Use a minimum of 100 L/ha of water for ground application and 50 L/ha of water for aerial application. Maximum 2 applications/yr with a minimum spray interval of 10–14 days. 6-day re-entry period.                                                                                                                                                  |

## WHEAT DISEASES

**Table 4–19.** Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — *Stagonospora* Glume Blotch  
See Appendix H. Cereal Growth Stages, on page 193.

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                  | Active Ingredient              | Trade Name     | Rate                            | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|----------------|---------------------------------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>STAGONOSPORA GLUME BLOTCH (<i>Stagonospora nodorum</i>)</b>                                                                                                                                                      |                                |                |                                 |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Foliar Treatment</b>                                                                                                                                                                                             |                                |                |                                 |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Prolonged wet periods in May and early June result in increased disease incidence. Rotate with crops other than cereals, plow down cereal residues and remove volunteer wheat to reduce survivability of the fungi. | prothioconazole + tebuconazole | Prosaro 250 EC | 800 mL/ha (324 mL/acre)         | 36  | Ground and aerial application. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                     | prothioconazole                | Proline 480 SC | 315–420 mL/ha (128–170 mL/acre) | 30  | Ground and aerial application. Timing of application is critical. Apply from when at least 75% of the wheat heads on the main stem are fully emerged (Zadok's 59) to when 50% of the heads on the main stem are in flower (Zadok's 65). Use higher rate when expecting high disease pressure. Use with the registered non-ionic surfactant, Agral 90 or AgSurf at 0.125% vol/vol. Maximum 2 applications/yr (735 mL/ha) with a minimum 7-day interval between applications. 24-hr re-entry period.                                                                                                                                                                                                        |
|                                                                                                                                                                                                                     | tebuconazole                   | Folicur 250 EW | 500 mL/ha (200 mL/acre)         | 36  | Ground and aerial application. Apply from when at least 75% of the wheat heads on the main stem are fully emerged (Zadok's 59) to when 50% of the heads on the main stem are in flower (Zadok's 65). The use of a non-ionic surfactant (Agral 90 or Agsurf) is <b>NOT</b> required as it is built into the formulation. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.<br><br>Before using Folicur for wheat leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence. |
|                                                                                                                                                                                                                     |                                | Folicur 432 F  | 292 mL/ha (118 mL/acre)         | 36  | Ground and aerial application. Apply from when at least 75% of the wheat heads on the main stem are fully emerged (Zadok's 59) to when 50% of the heads on the main stem are in flower (Zadok's 65). Use non-ionic surfactant such as Agral 90 or Agsurf at 0.125% vol/vol. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.<br><br>Before using Folicur for wheat leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.                                             |
|                                                                                                                                                                                                                     | chlorothalonil                 | Bravo 500      | 1.5–2.5 mL/ha (0.6–1.0 L/acre)  | 30  | Ground and aerial application. Apply at Zadok's growth stage 37 (flag leaf emergence) and repeat 10–14 days later at growth stage 51–55 (visible ear). A 3rd application at growth stage 59–69 (ear fully emerged) may be necessary if conditions favour disease spread. Maximum 3 applications/yr.                                                                                                                                                                                                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                     | propiconazole                  | Tilt 250 E     | 500 mL/ha (200 mL/acre)         | 45  | Ground and aerial application. Apply at early signs of disease from the beginning of stem elongation (Zadok's 29–37). If conditions favourable to disease continue, apply again, if necessary, before head is half emerged (Zadok's 49–55). Can be tank-mixed with several cereal herbicides. Maximum 2 applications/yr.                                                                                                                                                                                                                                                                                                                                                                                  |
|                                                                                                                                                                                                                     |                                | Bumper 418 EC  | 300 mL/ha (121 mL/acre)         |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |

## WHEAT DISEASES

**Table 4–20.** Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Stripe Rust  
See Appendix H. Cereal Growth Stages, on page 193.

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                  | Active Ingredient            | Trade Name    | Rate                             | PHI                                    | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|---------------|----------------------------------|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>STRIPE RUST (<i>Puccinia striiformis</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                    |                              |               |                                  |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Foliar Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                             |                              |               |                                  |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Stripe rust can be confused with cephalosporium stripe since both will produce a yellow striping (interveinal) that can extend the entire length of the leaf. If rust is the cause, orange-yellow pustules (blisters) can be found, whereas no blistering is found in cephalosporium stripe. This disease is most noticeable in seasons with a prolonged cool spring (3°C–15°C). Symptoms often disappear as temperatures increase. | azoxystrobin + propiconazole | Blanket AP    | 200–300 mL/ha (80–120 mL/acre)   | Do not apply at boot stage and beyond. | For commercial and on-farm treating. Apply once between stem elongation and half-head emergence. Good spray coverage and canopy penetration are important for best results.                                                                                                                                                                                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                     | pyraclostrobin               | Headline EC   | 400–600 mL/ha (160–240 mL/acre)  | Do not apply at boot stage and beyond. | Ground and aerial application. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                     | pyraclostrobin + metconazole | Twinline      | 380–500 mL/ha (150–200 mL/acre)  | Do not apply at boot stage and beyond. | Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Ensure thorough coverage of foliage. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 6-day re-entry period. No later than end of flowering.                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                     | azoxystrobin + propiconazole | Quilt         | 0.75–1.0 L/ha (305–406 mL/acre)  | Do not apply at boot stage and beyond. | Ground and aerial application. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Use higher application rate of 1 L/ha when expecting high disease pressure from stripe rust and wheat leaf rust. Maximum 1 application/yr. Do not harvest for forage. 12-hr re-entry period.                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                     | propiconazole                | Tilt 250 E    | 500 mL/ha (200 mL/acre)          | 45                                     | Ground and aerial application. Apply at early signs of disease from the beginning of stem elongation (Zadok's 29–37). If conditions favourable to disease continue, apply again, if necessary, before head is half emerged (Zadok's 49–55). Can be tank-mixed with several cereal herbicides. Maximum 2 applications/yr.                                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                     |                              | Bumper 418 EC | 300 mL/ha (121 mL/acre)          |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                     | picoxystrobin                | Acapela       | 0.44–0.88 L/ha (178–356 mL/acre) | Do not apply at boot stage and beyond. | Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Use high rate and shorter interval when disease pressure is high. Optimum protection of flag leaf is provided when applied at “flag leaf out” (Zadok's 39). Do not apply after flowering (Zadok's 59). Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha/season. 12-hr re-entry period. |

## WHEAT DISEASES

**Table 4–20.** Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Stripe Rust  
See Appendix H. Cereal Growth Stages, on page 193.

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                        | Active Ingredient               | Trade Name      | Rate                               | PHI                                    | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------------------------------|---------------------------------|-----------------|------------------------------------|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>STRIPE RUST (<i>Puccinia striiformis</i>) (cont'd)</b> |                                 |                 |                                    |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| (cont'd)                                                  | tebuconazole                    | Folicur 250 EW  | 375–500 mL/ha<br>(152–200 mL/acre) | 36                                     | Ground and aerial application. Apply to leaf foliage at the first sign or very early stage of disease, especially if weather conditions are conducive to disease development, up to the end of the flowering stage. Use the higher rate when weather conditions are conducive to heavy disease development. The use of a non-ionic surfactant (Agral 90 or Agsurf) is <b>NOT</b> required as it is built into the formulation. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.<br><br>Before using Folicur for wheat leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence. |
|                                                           |                                 | Folicur 432 F   | 220–292 mL/ha<br>(90–118 mL/acre)  | 36                                     | Ground and aerial application. Apply to leaf foliage at the first sign or very early stage of disease, especially if weather conditions are conducive to disease development, up to the end of the flowering stage. Use the higher rate when weather conditions are conducive to heavy disease development. Use non-ionic surfactant such as Agral 90 or Agsurf at 0.125% vol/vol. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.<br><br>Before using Folicur for wheat leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.                                             |
|                                                           | trifloxystrobin + propiconazole | Stratego 250 EC | 500 mL/ha<br>(200 mL/acre)         | Do not apply at boot stage and beyond. | Ground and aerial application. Do not apply the second application within 14 days of the first. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Can be tank-mixed with Buctril M in wheat. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                                           | prothioconazole + tebuconazole  | Prosaro 250 EC  | 800 mL/ha<br>(324 mL/acre)         | 36                                     | Ground and aerial application. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                                           | pyraclostrobin + fluxapyroxad   | Priaxor         | 0.225–0.3 L/ha<br>(90–120 mL/acre) | Do not apply at boot stage and beyond. | Ground and aerial application. For optimal disease control, begin applications prior to disease development at the onset of disease symptoms. Applications should be made prior to head emergence. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

## BARLEY DISEASES

**Table 4–21.** Chemical Control Options for Seed and Seedling Diseases in Barley — Seed Rot and Seedling Blight

| Integrated Pest Management Options                                                                                                                   | Active Ingredient                          | Trade Name     | Rate                   | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SEED ROT and SEEDLING BLIGHT</b>                                                                                                                  |                                            |                |                        |                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Seed Treatment</b>                                                                                                                                |                                            |                |                        |                                                                                                                                                                                                                                                                                                                                                                                                      |
| Ensure good coverage of seed treatment on the seeds. Rotation with non-host crops for at least 2 yr will reduce risk of disease. Avoid deep seeding. | tebuconazole + thiram                      | Raxil T        | 225 mL/100 kg seed     | For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                                                                                                                                                                                                                                                     |
|                                                                                                                                                      | tebuconazole + metalaxyl                   | Raxil MD       | 300 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provides good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting. |
|                                                                                                                                                      | carbathiin + thiram                        | Vitaflor 280   | 230–330 mL/100 kg seed | <b>For use in commercial seed treatment facilities only.</b> Do not graze or feed livestock on treated areas for 6 weeks after planting.                                                                                                                                                                                                                                                             |
|                                                                                                                                                      | triticonazole + thiram                     | Gemini         | 360 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder.                                                                                                                                                                                                                      |
|                                                                                                                                                      | ipconazole                                 | Rancona Apex   | 325 mL/100 kg seed     | For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 30 days after planting.                                                                                                                                                                                                                                                                                     |
|                                                                                                                                                      | penflufen + prothioconazole + metalaxyl    | EverGol Energy | 65 mL/100 kg seed      | For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.                                                                                                   |
|                                                                                                                                                      | tebuconazole + prothioconazole + metalaxyl | Raxil Pro MD   | 325 mL/100 kg seed     | Use only in treating equipment that can accurately control application rates and provide good distribution of the chemical onto the seed in the mixing chamber. Uniform application to seed is necessary to ensure best disease protection and seed safety. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                              |
|                                                                                                                                                      | difenoconazole + metalaxyl-M + sedaxane    | Vibrance XL    | 180–360 mL/100 kg seed | <b>For use in commercial seed treatment facilities only.</b> For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.                                                                    |

## BARLEY DISEASES

**Table 4–22.** Chemical Control Options for Seed and Seedling Diseases in Barley — Rhizoctonia, Common Seedling Blight

| Integrated Pest Management Options                                                                                                                                                                                                                        | Active Ingredient                          | Trade Name     | Rate                       | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>RHIZOCTONIA (<i>Rhizoctonia solani</i>)</b>                                                                                                                                                                                                            |                                            |                |                            |                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                     |                                            |                |                            |                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Sow into a well-prepared seedbed under good growing conditions. Avoid cool, wet conditions that will reduce emergence and increase seed rots and blights. Treat seed with a fungicide seed treatment and ensure good coverage of seed treatment on seeds. | difenoconazole + metalaxyl-M + sedaxane    | Vibrance XL    | 180–360 mL/<br>100 kg seed | <b>For use in commercial seed treatment facilities only.</b> For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.                                                                                                      |
|                                                                                                                                                                                                                                                           | penflufen + prothioconazole + metalaxyl    | EverGol Energy | 65 mL/<br>100 kg seed      | For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but refer to the label of the tank-mix partner for application rates, precautions and directions.                                                                                                                                |
| <b>COMMON SEEDLING BLIGHT (<i>Cochliobolus sativus</i>)</b>                                                                                                                                                                                               |                                            |                |                            |                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                     |                                            |                |                            |                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Avoid frequent or continuous barley crops in a rotation. Avoid deep seeding. Turn under crop stubble to help reduce infection levels. Plant resistant varieties. Consult with your seed company for variety profiles.                                     | tebuconazole + thiram                      | Raxil T        | 225 mL/<br>100 kg seed     | For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                                                                                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                                                           | tebuconazole + metalaxyl                   | Raxil MD       | 300 mL/<br>100 kg seed     | <b>Provides suppression only.</b> For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provides good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting. |
|                                                                                                                                                                                                                                                           | ipconazole                                 | Rancona Apex   | 325 mL/<br>100 kg seed     | For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 30 days after planting.                                                                                                                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                                                           | penflufen + prothioconazole + metalaxyl    | EverGol Energy | 65 mL/<br>100 kg seed      | For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.                                                                                                                                     |
|                                                                                                                                                                                                                                                           | tebuconazole + prothioconazole + metalaxyl | Raxil Pro MD   | 325 mL/<br>100 kg seed     | Use only in treating equipment that can accurately control application rates and provide good distribution of the chemical onto the seed in the mixing chamber. Uniform application to seed is necessary to ensure best disease protection and seed safety. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                                                                |
|                                                                                                                                                                                                                                                           | difenoconazole + metalaxyl-M + sedaxane    | Vibrance XL    | 180–360 mL/<br>100 kg seed | <b>For use in commercial seed treatment facilities only.</b> For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.                                                                                                      |

## BARLEY DISEASES

**Table 4–23.** Chemical Control Options for Seed and Seedling Diseases in Barley — Covered Smut (Common Bunt)

| Integrated Pest Management Options                                                                                                                                                                 | Active Ingredient                          | Trade Name     | Rate                   | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>COVERED SMUT (COMMON BUNT) (<i>Ustilago hordei</i>)</b>                                                                                                                                         |                                            |                |                        |                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Seed Treatment</b>                                                                                                                                                                              |                                            |                |                        |                                                                                                                                                                                                                                                                                                                                                                                                      |
| This disease is spread from year to year primarily through infected seed. Wind-blown spores will infect florets within season. Use pedigreed seed that is treated with a fungicide seed treatment. | tebuconazole + thiram                      | Raxil T        | 225 mL/100 kg seed     | For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                                                                                                                                                                                                                                                     |
|                                                                                                                                                                                                    | tebuconazole + metalaxyl                   | Raxil MD       | 300 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provides good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting. |
|                                                                                                                                                                                                    | carbathiin + thiram                        | Vitaflo 280    | 230–330 mL/100 kg seed | <b>For use in commercial seed treatment facilities only.</b> Do not graze or feed livestock on treated areas for 6 weeks after planting.                                                                                                                                                                                                                                                             |
|                                                                                                                                                                                                    | triticonazole + thiram                     | Gemini         | 360 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder.                                                                                                                                                                                                                      |
|                                                                                                                                                                                                    | ipconazole                                 | Rancona Apex   | 325 mL/100 kg seed     | For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 30 days after planting.                                                                                                                                                                                                                                                                                     |
|                                                                                                                                                                                                    | penflufen + prothioconazole + metalaxyl    | EverGol Energy | 65 mL/100 kg seed      | For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.                                                                                                   |
|                                                                                                                                                                                                    | tebuconazole + prothioconazole + metalaxyl | Raxil Pro MD   | 325 mL/100 kg seed     | Use only in treating equipment that can accurately control application rates and provide good distribution of the chemical onto the seed in the mixing chamber. Uniform application to seed is necessary to ensure best disease protection and seed safety. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                              |
|                                                                                                                                                                                                    | difenoconazole + metalaxyl-M + sedaxane    | Vibrance XL    | 180–360 mL/100 kg seed | <b>For use in commercial seed treatment facilities only.</b> For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.                                                                    |

## BARLEY DISEASES

**Table 4–24.** Chemical Control Options for Seed and Seedling Diseases in Barley — True Loose Smut

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                     | Active Ingredient                          | Trade Name     | Rate                   | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>TRUE LOOSE SMUT (<i>Ustilago nuda</i>)</b>                                                                                                                                                                                                                                                                                                                                                          |                                            |                |                        |                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                  |                                            |                |                        |                                                                                                                                                                                                                                                                                                                                                                                                     |
| Infection occurs during flowering. Conditions that promote the disease are wet, cloudy weather and moderate temperatures 16°C–22°C. Sow pedigreed seed to ensure that seed is not infected. Moist weather at flowering promotes this disease. Disease incidence has been increasing in Ontario where no seed treatment has been used. Seed treatments are beneficial in reducing loose smut infection. | tebuconazole + thiram                      | Raxil T        | 225 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                                                                                                                                                                                                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                        | tebuconazole + metalaxyl                   | Raxil MD       | 300 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provide good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting. |
|                                                                                                                                                                                                                                                                                                                                                                                                        | carbathiin + thiram                        | Vitaflo 280    | 230–330 mL/100 kg seed | <b>For use in commercial seed treatment facilities only.</b> Do not graze or feed livestock on treated areas for 6 weeks after planting.                                                                                                                                                                                                                                                            |
|                                                                                                                                                                                                                                                                                                                                                                                                        | triticonazole + thiram                     | Gemini         | 360 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder.                                                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                        | ipconazole                                 | Rancona Apex   | 325–433 mL/100 kg seed | For commercial and on-farm treating. Use higher rate for highly infected seed lots only. Do not graze or feed livestock on treated areas for 30 days after planting.                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                        | penflufen + prothioconazole + metalaxyl    | EverGol Energy | 65 mL/100 kg seed      | For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.                                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                        | tebuconazole + prothioconazole + metalaxyl | Raxil Pro MD   | 325 mL/100 kg seed     | Use only in treating equipment that can accurately control application rates and provide good distribution of the chemical onto the seed in the mixing chamber. Uniform application to seed is necessary to ensure best disease protection and seed safety. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                             |
|                                                                                                                                                                                                                                                                                                                                                                                                        | difenoconazole + metalaxyl-M + sedaxane    | Vibrance XL    | 180–360 mL/100 kg seed | <b>For use in commercial seed treatment facilities only.</b> For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.                                                                   |

## BARLEY DISEASES

**Table 4–25.** Chemical Control Options for Seed and Seedling Diseases in Barley — Pythium

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                 | Active Ingredient                          | Trade Name     | Rate                   | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>PYTHIUM (<i>Pythium</i> spp.)</b>                                                                                                                                                                                                                                                                                               |                                            |                |                        |                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                              |                                            |                |                        |                                                                                                                                                                                                                                                                                                                                                                                                      |
| This disease can occur on all soil types, but losses are greatest in cold, wet clay soils. Minimize soil compaction and remove excess moisture through improved drainage. Seed treatments containing metalaxyl and metalaxyl-M can reduce infection. Delay planting until conditions will result in a rapid and uniform emergence. | tebuconazole + thiram                      | Raxil T        | 225 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                                                                                                                                                                                                                         |
|                                                                                                                                                                                                                                                                                                                                    | tebuconazole + metalaxyl                   | Raxil MD       | 300 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provides good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting. |
|                                                                                                                                                                                                                                                                                                                                    | carbathiin + thiram                        | Vitaflo 280    | 230–330 mL/100 kg seed | <b>For use in commercial seed treatment facilities only.</b> Do not graze or feed livestock on treated areas for 6 weeks after planting.                                                                                                                                                                                                                                                             |
|                                                                                                                                                                                                                                                                                                                                    | triticonazole + thiram                     | Gemini         | 360 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder.                                                                                                                                                                                                                      |
|                                                                                                                                                                                                                                                                                                                                    | ipconazole                                 | Rancona Apex   | 325–433 mL/100 kg seed | For commercial and on-farm treating. Use higher rate for highly infected seed lots only. Do not graze or feed livestock on treated areas for 30 days after planting.                                                                                                                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                                                    | penflufen + prothioconazole + metalaxyl    | EverGol Energy | 65 mL/100 kg seed      | For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                    | tebuconazole + prothioconazole + metalaxyl | Raxil Pro MD   | 325 mL/100 kg seed     | Use only in treating equipment that can accurately control application rates and provide good distribution of the chemical onto the seed in the mixing chamber. Uniform application to seed is necessary to ensure best disease protection and seed safety. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                              |
|                                                                                                                                                                                                                                                                                                                                    | difenoconazole + metalaxyl-M + sedaxane    | Vibrance XL    | 180–360 mL/100 kg seed | <b>For use in commercial seed treatment facilities only.</b> For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.                                                                    |

## BARLEY DISEASES

**Table 4–26.** Chemical Control Options for Seed and Seedling Diseases in Barley — False Loose Smut

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                     | Active Ingredient                          | Trade Name     | Rate                   | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>FALSE LOOSE SMUT (<i>Ustilago nuda</i>)</b>                                                                                                                                                                                                                                                                                                                                                         |                                            |                |                        |                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                  |                                            |                |                        |                                                                                                                                                                                                                                                                                                                                                                                                      |
| Infection occurs during flowering. Conditions that promote the disease are wet, cloudy weather and moderate temperatures 16°C–22°C. Sow pedigreed seed to ensure that seed is not infected. Moist weather at flowering promotes this disease. Disease incidence has been increasing in Ontario where no seed treatment has been used. Seed treatments are beneficial in reducing loose smut infection. | tebuconazole + thiram                      | Raxil T        | 225 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                                                                                                                                                                                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                        | tebuconazole + metalaxyl                   | Raxil MD       | 300 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provides good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting. |
|                                                                                                                                                                                                                                                                                                                                                                                                        | carbathiin + thiram                        | Vitaflo 280    | 230–330 mL/100 kg seed | <b>For use in commercial seed treatment facilities only.</b> Do not graze or feed livestock on treated areas for 6 weeks after planting.                                                                                                                                                                                                                                                             |
|                                                                                                                                                                                                                                                                                                                                                                                                        | triticonazole + thiram                     | Gemini         | 360 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder.                                                                                                                                                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                        | ipconazole                                 | Rancona Apex   | 325–433 mL/100 kg seed | For commercial and on-farm treating. Use higher rate for highly infected seed lots only. Do not graze or feed livestock on treated areas for 30 days after planting.                                                                                                                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                                                                                                                        | penflufen + prothioconazole + metalaxyl    | EverGol Energy | 65 mL/100 kg seed      | For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                        | tebuconazole + prothioconazole + metalaxyl | Raxil Pro MD   | 325 mL/100 kg seed     | Use only in treating equipment that can accurately control application rates and provide good distribution of the chemical onto the seed in the mixing chamber. Uniform application to seed is necessary to ensure best disease protection and seed safety. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                        | difenoconazole + metalaxyl-M + sedaxane    | Vibrance XL    | 180–360 mL/100 kg seed | <b>For use in commercial seed treatment facilities only.</b> For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.                                                                    |

## BARLEY DISEASES

**Table 4–27.** Chemical Control Options for Seed and Seedling Diseases in Barley — Fusarium

| Integrated Pest Management Options                                                                                                                              | Active Ingredient                          | Trade Name     | Rate                   | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>FUSARIUM spp. (seed and soil borne, damping off and seedling blight)</b>                                                                                     |                                            |                |                        |                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Seed Treatment</b>                                                                                                                                           |                                            |                |                        |                                                                                                                                                                                                                                                                                                                                                                                                      |
| Ensure good coverage of seed treatment on seeds. Rotation with non-host crops for at least 2 yr will reduce risk. Use disease-free seed and avoid deep seeding. | tebuconazole + thiram                      | Raxil T        | 225 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                                                                                                                                                                                                                         |
|                                                                                                                                                                 | tebuconazole + metalaxyl                   | Raxil MD       | 300 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provides good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting. |
|                                                                                                                                                                 | carbathiin + thiram                        | Vitaflo 280    | 230–330 mL/100 kg seed | <b>For use in commercial seed treatment facilities only.</b> Do not graze or feed livestock on treated areas for 6 weeks after planting.                                                                                                                                                                                                                                                             |
|                                                                                                                                                                 | triticonazole + thiram                     | Gemini         | 360 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder.                                                                                                                                                                                                                      |
|                                                                                                                                                                 | ipconazole                                 | Rancona Apex   | 325–433 mL/100 kg seed | For commercial and on-farm treating. Use higher rate for highly infected seed lots only. Do not graze or feed livestock on treated areas for 30 days after planting.                                                                                                                                                                                                                                 |
|                                                                                                                                                                 | penflufen + prothioconazole + metalaxyl    | EverGol Energy | 65 mL/100 kg seed      | For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.                                                                                                   |
|                                                                                                                                                                 | tebuconazole + prothioconazole + metalaxyl | Raxil Pro MD   | 325 mL/100 kg seed     | Use only in treating equipment that can accurately control application rates and provide good distribution of the chemical onto the seed in the mixing chamber. Uniform application to seed is necessary to ensure best disease protection and seed safety. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                              |
|                                                                                                                                                                 | difenoconazole + metalaxyl-M + sedaxane    | Vibrance XL    | 180–360 mL/100 kg seed | <b>For use in commercial seed treatment facilities only.</b> For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.                                                                    |

## BARLEY DISEASES

**Table 4–28.** Chemical Control Options for Seed and Seedling Diseases in Barley — Aspergillus

| Integrated Pest Management Options                                                                                                                                                                                                                         | Active Ingredient                          | Trade Name     | Rate                   | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>ASPERGILLUS</b>                                                                                                                                                                                                                                         |                                            |                |                        |                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                      |                                            |                |                        |                                                                                                                                                                                                                                                                                                                                                                                                      |
| Sow into a well-prepared seed bed under good growing conditions. Avoid cool, wet conditions that will reduce emergence and increase seed rots and blights. Treat seed with a fungicide seed treatment and ensure good coverage of seed treatment on seeds. | tebuconazole + thiram                      | Raxil T        | 225 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                                                                                                                                                                                                                         |
|                                                                                                                                                                                                                                                            | tebuconazole + metalaxyl                   | Raxil MD       | 300 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provides good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting. |
|                                                                                                                                                                                                                                                            | carbathiin + thiram                        | VitaFlo 280    | 230–330 mL/100 kg seed | <b>For use in commercial seed treatment facilities only.</b> Do not graze or feed livestock on treated areas for 6 weeks after planting.                                                                                                                                                                                                                                                             |
|                                                                                                                                                                                                                                                            | triticonazole + thiram                     | Gemini         | 360 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder.                                                                                                                                                                                                                      |
|                                                                                                                                                                                                                                                            | ipconazole                                 | Rancona Apex   | 325–433 mL/100 kg seed | For commercial and on-farm treating. Use higher rate for highly infected seed lots only. Do not graze or feed livestock on treated areas for 30 days after planting.                                                                                                                                                                                                                                 |
|                                                                                                                                                                                                                                                            | penflufen + prothioconazole + metalaxyl    | EverGol Energy | 65 mL/100 kg seed      | <b>For commercial seed treating only.</b> May be tank-mixed, but see the registered label of the tank-mix partner for application rates, precautions and directions.                                                                                                                                                                                                                                 |
|                                                                                                                                                                                                                                                            | tebuconazole + prothioconazole + metalaxyl | Raxil Pro MD   | 325 mL/100 kg seed     | Use only in treating equipment that can accurately control application rates and provide good distribution of the chemical onto the seed in the mixing chamber. Uniform application to seed is necessary to ensure best disease protection and seed safety. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                              |
|                                                                                                                                                                                                                                                            | difenoconazole + metalaxyl-M + sedaxane    | Vibrance XL    | 180–360 mL/100 kg seed | <b>For use in commercial seed treatment facilities only.</b> For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.                                                                    |

## BARLEY DISEASES

**Table 4–29.** Chemical Control Options for Seed and Seedling Diseases in Barley — Barley Leaf Stripe

| Integrated Pest Management Options                                                                                                                   | Active Ingredient                          | Trade Name     | Rate                   | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>BARLEY LEAF STRIPE</b>                                                                                                                            |                                            |                |                        |                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Seed Treatment</b>                                                                                                                                |                                            |                |                        |                                                                                                                                                                                                                                                                                                                                                                                                      |
| The disease is seed-borne and causes long brown stripes on the leaves, usually around heading. Use good-quality seed and a fungicide seed treatment. | tebuconazole + thiram                      | Raxil T        | 225 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                                                                                                                                                                                                                         |
|                                                                                                                                                      | tebuconazole + metalaxyl                   | Raxil MD       | 300 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provides good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting. |
|                                                                                                                                                      | carbathiin + thiram                        | Vitaflo 280    | 230–330 mL/100 kg seed | <b>For use in commercial seed treatment facilities only.</b> Do not graze or feed livestock on treated areas for 6 weeks after planting.                                                                                                                                                                                                                                                             |
|                                                                                                                                                      | triticonazole + thiram                     | Gemini         | 360 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder.                                                                                                                                                                                                                      |
|                                                                                                                                                      | ipconazole                                 | Rancona Apex   | 325–433 mL/100 kg seed | For commercial and on-farm treating. Use higher rate for highly infected seed lots only. Do not graze or feed livestock on treated areas for 30 days after planting.                                                                                                                                                                                                                                 |
|                                                                                                                                                      | penflufen + prothioconazole + metalaxyl    | EverGol Energy | 65 mL/100 kg seed      | For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.                                                                                                   |
|                                                                                                                                                      | tebuconazole + prothioconazole + metalaxyl | Raxil Pro MD   | 325 mL/100 kg seed     | Use only in treating equipment that can accurately control application rates and provide good distribution of the chemical onto the seed in the mixing chamber. Uniform application to seed is necessary to ensure best disease protection and seed safety. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                              |
|                                                                                                                                                      | difenoconazole + metalaxyl-M + sedaxane    | Vibrance XL    | 180–360 mL/100 kg seed | <b>For use in commercial seed treatment facilities only.</b> For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.                                                                    |

## BARLEY DISEASES

**Table 4–30.** Chemical Control Options for Foliar, Stem and Head Diseases in Barley — Net Blotch

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                | Active Ingredient               | Trade Name      | Rate                               | PHI                                    | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------|------------------------------------|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>NET BLOTCH (<i>Pyrenophora teres</i>)</b>                                                                                                      |                                 |                 |                                    |                                        |                                                                                                                                                                                                                                                                                                                                            |
| <b>Foliar Treatment</b>                                                                                                                           |                                 |                 |                                    |                                        |                                                                                                                                                                                                                                                                                                                                            |
| Avoid growing barley after barley, wheat or grasses in a rotation. Plow down stubble and straw, and plant early to avoid serious disease in July. | pyraclostrobin                  | Headline EC     | 300–600 mL/ha<br>(121–240 mL/acre) | Do not apply at boot stage and beyond. | Ground and aerial application. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                          |
|                                                                                                                                                   | azoxystrobin + propiconazole    | Quilt           | 750 mL/ha<br>(305 mL/acre)         | Do not apply at boot stage and beyond. | Ground and aerial application. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 1 application/yr. Do not harvest for forage. 12-hr re-entry period.                                                                                                                |
|                                                                                                                                                   | prothioconazole                 | Proline 480 SC  | 210–315 mL/ha<br>(85–128 mL/acre)  | 30                                     | Ground and aerial application. Use as a preventive treatment when earliest disease symptoms appear on the leaves and stems. Use with the registered non-ionic surfactant, Agral 90 or AgSurf at 0.125% vol/vol. Maximum 2 applications/yr with a minimum 7-day interval between applications. 24-hr re-entry period.                       |
|                                                                                                                                                   | pyraclostrobin + metconazole    | Twinline        | 380–500 mL/ha<br>(150–200 mL/acre) | Do not apply at boot stage and beyond. | Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Ensure thorough coverage of foliage. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 6-day re-entry period. |
|                                                                                                                                                   | prothioconazole + tebuconazole  | Prosaro 250 EC  | 800 mL/ha<br>(324 mL/acre)         | 36                                     | Ground and aerial application. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.                                                                                                                                                        |
|                                                                                                                                                   | azoxystrobin + propiconazole    | Blanket AP      | 200–300 mL/ha<br>(80–120 mL/acre)  | Do not apply at boot stage and beyond. | For commercial and on-farm treating. Apply once up to boot stage. Good spray coverage and canopy penetration are important for best results.                                                                                                                                                                                               |
|                                                                                                                                                   | trifloxystrobin + propiconazole | Stratego 250 EC | 500 mL/ha<br>(200 mL/acre)         | Do not apply at boot stage and beyond. | <b>For use in spring barley only.</b> Ground and aerial application. Do not apply the second application within 14 days of the first. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.                                   |

## BARLEY DISEASES

**Table 4–30.** Chemical Control Options for Foliar, Stem and Head Diseases in Barley — Net Blotch

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                    | Active Ingredient | Trade Name     | Rate                               | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------------------------------------|-------------------|----------------|------------------------------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>NET BLOTCH (<i>Pyrenophora teres</i>) (cont'd)</b> |                   |                |                                    |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| (cont'd)                                              | metconazole       | Caramba        | 500–700 mL/ha<br>(200–280 mL/acre) | 30  | Ground and aerial application. Apply to leaf foliage at the first sign or very early stage of disease up to the end of the flowering stage. Use the higher leaf disease rate when weather conditions are conducive to heavy disease development. Use a minimum of 100 L/ha of water for ground application and 50 L/ha of water for aerial application. Maximum 1 application/yr. 5-day re-entry.                                                                                                                                                                                                                                                |
|                                                       | tebuconazole      | Folicur 250 EW | 375–500 mL/ha<br>(152–200 mL/acre) | 36  | Ground and aerial application. Apply at the very early stages of disease development. Use higher rate when disease pressure is severe. The use of a non-ionic surfactant (Agral 90 or Agsurf) is <b>NOT</b> required as it is built into the formulation. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.<br><br>Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence. |
|                                                       |                   | Folicur 432 F  | 220–292 mL/ha<br>(90–118 mL/acre)  | 36  | Ground and aerial application. Apply at the very early stages of disease development. Use higher rate when disease pressure is severe. Use non-ionic surfactant such as Agral 90 or Agsurf at 0.125% vol/vol. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.<br><br>Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.                                             |
|                                                       | propiconazole     | Tilt 250 E     | 250–500 mL/ha<br>(100–200 mL/acre) | 45  | Ground and aerial application. Early application at Zadok's 12–23. For early-season disease suppression, use low rate. Use higher rate for fields with high disease pressure history or field conditions favourable for disease development. Use for later application at first sign of disease (Zadok's 29–37) or before head is half emerged (Zadok's 49–55). Apply only the high rate on any application from Zadok's 29–55. Maximum 2 applications/yr.                                                                                                                                                                                       |
|                                                       |                   | Bumper 418 EC  | 150–300 mL/ha<br>(60–121 mL/acre)  | 45  | <b>For use in spring barley only.</b> Ground and aerial application. For early-season disease suppression, use the lower rate at Zadok's 12–23 (as early as the two-leaf stage). Use the high rate on fields with a history of disease pressure. For later-season application, apply at early signs of disease from the beginning of stem elongation (Zadok's 29–37). If conditions favourable to disease continue, apply again, if necessary, before head is half emerged (Zadok's 49–55). Apply only the high rate from Zadok's 29–55. Maximum 2 applications/yr.                                                                              |

## BARLEY DISEASES

**Table 4–30.** Chemical Control Options for Foliar, Stem and Head Diseases in Barley — Net Blotch

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                    | Active Ingredient                | Trade Name | Rate                                | PHI                                                | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------------------------|----------------------------------|------------|-------------------------------------|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>NET BLOTCH (<i>Pyrenophora teres</i>) (cont'd)</b> |                                  |            |                                     |                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| (cont'd)                                              | azoxystrobin<br>+ propiconazole  | Quilt      | 0.5–1.0 L/ha<br>(202–406 mL/acre)   | 30                                                 | Ground and aerial application. Apply at first sign of disease starting at the 2-leaf stage and up to flag leaf fully emerged stage. Do not apply at boot stage and beyond. Where a rate range is indicated, use the higher rate if there is a history of high disease pressure in the field or field conditions favour disease development. 12-hr re-entry period. Maximum 2 applications/yr.                                                                                         |
|                                                       | picoxystrobin                    | Acapela    | 0.44–0.88 L/ha<br>(178–356 mL/acre) | Do not<br>apply<br>at boot<br>stage and<br>beyond. | Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Use high rate and shorter interval when disease pressure is high. Optimum protection of flag leaf is provided when applied at “flag leaf out” (Zadok’s 39). Do not apply at boot stage (Zadok’s 47) and beyond. Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha/season. 12-hr re-entry period. |
|                                                       | pyraclostrobin<br>+ fluxapyroxad | Priaxor    | 0.225–0.3 L/ha<br>(90–120 mL/acre)  | 21                                                 | Ground and aerial application. For optimal disease control, begin applications prior to disease development at the onset of disease symptoms. Applications should be made prior to head emergence. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                          |

## BARLEY DISEASES

**Table 4–31.** Chemical Control Options for Foliar, Stem and Head Diseases in Barley — Spot Blotch

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                               | Active Ingredient              | Trade Name     | Rate                               | PHI                                    | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|----------------|------------------------------------|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SPOT BLOTCH (<i>Cochliobolus sativus</i>)</b>                                                                                                 |                                |                |                                    |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Foliar Treatment</b>                                                                                                                          |                                |                |                                    |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Avoid growing barley after barley, wheat or grasses in a rotation. Plow down stubble and straw and plant early to avoid serious disease in July. | pyraclostrobin                 | Headline EC    | 400–600 mL/ha<br>(160–240 mL/acre) | Do not apply at boot stage and beyond. | Ground and aerial application. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                  | prothioconazole                | Proline 480 SC | 210–315 mL/ha<br>(85–128 mL/acre)  | 30                                     | Ground and aerial application. Use as a preventive treatment when earliest disease symptoms appear on the leaves and stems. Use with the registered non-ionic surfactant, Agral 90 or AgSurf at 0.125% vol/vol. Maximum 2 applications/yr with a minimum 7-day interval between applications. 24-hr re-entry period.                                                                                                                                                                                                                                                                                                                             |
|                                                                                                                                                  | prothioconazole + tebuconazole | Prosaro 250 EC | 800 mL/ha<br>(324 mL/acre)         | 36                                     | Ground and aerial application. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                                                                                                                                  | pyraclostrobin + metconazole   | Twinline       | 380–500 mL/ha<br>(150–200 mL/acre) | Do not apply at boot stage and beyond. | Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Ensure thorough coverage of foliage. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 6 day re-entry period.                                                                                                                                                                                                                                                                                                       |
|                                                                                                                                                  | tebuconazole                   | Folicur 250 EW | 375–500 mL/ha<br>(152–200 mL/acre) | 36                                     | Ground and aerial application. Apply at the very early stages of disease development. Use higher rate when disease pressure is severe. The use of a non-ionic surfactant (Agral 90 or Agsurf) is <b>NOT</b> required as it is built into the formulation. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.<br><br>Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence. |
|                                                                                                                                                  |                                | Folicur 432 F  | 220–292 mL/ha<br>(90–118 mL/acre)  | 36                                     | Ground and aerial application. Apply at the very early stages of disease development. Use higher rate when disease pressure is severe. Use non-ionic surfactant such as Agral 90 or Agsurf at 0.125% vol/vol. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.<br><br>Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.                                             |

## BARLEY DISEASES

**Table 4–31.** Chemical Control Options for Foliar, Stem and Head Diseases in Barley — Spot Blotch

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                        | Active Ingredient                  | Trade Name      | Rate                               | PHI                                    | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                    |
|-----------------------------------------------------------|------------------------------------|-----------------|------------------------------------|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SPOT BLOTCH (<i>Cochliobolus sativus</i>) (cont'd)</b> |                                    |                 |                                    |                                        |                                                                                                                                                                                                                                                                                                                                                                                                         |
| (cont'd)                                                  | propiconazole                      | Tilt 250 E      | 500 mL/ha<br>(200 mL/acre)         | 45                                     | <b>For use in spring barley only.</b> Ground and aerial application. Apply at early signs of disease from the beginning of stem elongation (Zadok's 29–37). If conditions favourable to disease continue, apply again, if necessary, before head is half emerged (Zadok's 49–55). Maximum 2 applications/yr.                                                                                            |
|                                                           |                                    | Bumper 418 EC   | 300 mL/ha<br>(121 mL/acre)         |                                        |                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                                           | trifloxystrobin<br>+ propiconazole | Stratego 250 EC | 500 mL/ha<br>(200 mL/acre)         | Do not apply at boot stage and beyond. | <b>For use in spring barley only.</b> Ground and aerial application. Do not apply the second application within 14 days of the first. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                |
|                                                           | pyraclostrobin<br>+ metconazole    | Twinline        | 500–700 mL/ha<br>(200–280 mL/acre) | Do not apply at boot stage and beyond. | Ground and aerial application. Apply to leaf foliage at the first sign or very early stage of disease up to the boot stage. Use the higher rate to obtain extended protection and maximum yield benefits. Use a minimum of 100 L/ha of water for ground application and 50 L/ha of water for aerial application. Maximum 2 applications/yr with a minimum spray interval of 10–14 days. 6-day re-entry. |
|                                                           | pyraclostrobin<br>+ fluxapyroxad   | Priaxor         | 0.225–0.3 L/ha<br>(90–120 mL/acre) | Do not apply at boot stage and beyond. | Ground and aerial application. For optimal disease control, begin applications prior to disease development at the onset of disease symptoms. Applications should be made prior to head emergence. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 12-hr re-entry period.                                                                            |

## BARLEY DISEASES

**Table 4–32.** Chemical Control Options for Foliar, Stem and Head Diseases in Barley — Scald

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                               | Active Ingredient              | Trade Name     | Rate                            | PHI                                    | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|----------------|---------------------------------|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SCALD (<i>Rhynchosporium secalis</i>)</b>                                                                                                     |                                |                |                                 |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Foliar Treatment</b>                                                                                                                          |                                |                |                                 |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Avoid growing barley after barley, wheat or grasses in a rotation. Plow down stubble and straw and plant early to avoid serious disease in July. | azoxystrobin + propiconazole   | Blanket AP     | 200–300 mL/ha (80–120 mL/acre)  | Do not apply at boot stage and beyond. | For commercial and on-farm treating. Apply once up to boot stage. Good spray coverage and canopy penetration are important for best results.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                                                                                                                                  | pyraclostrobin                 | Headline EC    | 400–600 mL/ha (160–240 mL/acre) | Do not apply at boot stage and beyond. | Ground and aerial application. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                  | azoxystrobin + propiconazole   | Quilt          | 750 mL/ha (305 mL/acre)         | Do not apply at boot stage and beyond. | Ground and aerial application. Do not apply at boot stage and beyond. Maximum 1 application/yr. Do not harvest for forage. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                  | prothioconazole + tebuconazole | Prosaro 250 EC | 800 mL/ha (324 mL/acre)         | 36                                     | Ground and aerial application. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                                                                                                                                  | tebuconazole                   | Folicur 250 EW | 375–500 mL/ha (152–200 mL/acre) | 36                                     | Ground and aerial application. Apply at the very early stages of disease development. Use higher rate when disease pressure is severe. The use of a non-ionic surfactant (Agral 90 or Agsurf) is <b>NOT</b> required as it is built into the formulation. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.<br><br>Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence. |
|                                                                                                                                                  |                                | Folicur 432 F  | 220–292 mL/ha (90–118 mL/acre)  | 36                                     | Ground and aerial application. Apply at the very early stages of disease development. Use higher rate when disease pressure is severe. Use non-ionic surfactant such as Agral 90 or Agsurf at 0.125% vol/vol. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.<br><br>Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.                                             |

## BARLEY DISEASES

**Table 4–32.** Chemical Control Options for Foliar, Stem and Head Diseases in Barley — Scald

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                    | Active Ingredient               | Trade Name      | Rate                                | PHI                                    | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-------------------------------------------------------|---------------------------------|-----------------|-------------------------------------|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SCALD (<i>Rhynchosporium secalis</i>) (cont'd)</b> |                                 |                 |                                     |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| (cont'd)                                              | propiconazole                   | Tilt 250 E      | 500 mL/ha<br>(200 mL/acre)          | 45                                     | Ground and aerial application. Apply at early signs of disease from tillering to head half-emerged. Can be tank-mixed with several cereal herbicides.                                                                                                                                                                                                                                                                                                                                 |
|                                                       |                                 | Bumper 418 EC   | 300 mL/ha<br>(121 mL/acre)          | 45                                     | <b>For use in spring barley only.</b> Ground and aerial application. Apply at early signs of disease from the beginning of stem elongation (Zadok's 29–37). If conditions favourable to disease continue, apply again, if necessary, before head is half emerged (Zadok's 49–55). Maximum 2 applications/yr.                                                                                                                                                                          |
|                                                       | prothioconazole                 | Proline 480 SC  | 210–315 mL/ha<br>(85–128 mL/acre)   | 30                                     | <b>Ground and aerial application only.</b> Use as a preventive when earliest disease symptoms appear on the leaves and stems. Use with the registered non-ionic surfactant, Agral 90 or AgSurf at 0.125% vol/vol. Maximum 2 applications/yr with a minimum 7-day interval between applications. 24-hr re-entry period.                                                                                                                                                                |
|                                                       | trifloxystrobin + propiconazole | Stratego 250 EC | 500 mL/ha<br>(200 mL/acre)          | Do not apply at boot stage and beyond. | <b>For use in spring barley only.</b> Ground and aerial application. Do not apply the second application within 14 days of the first. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                              |
|                                                       | metconazole                     | Caramba         | 500–700 mL/ha<br>(200–280 mL/acre)  | 30                                     | Ground and aerial application. Apply to leaf foliage at the first sign or very early stage of disease up to the end of the flowering stage. Use the higher rate when weather conditions are conducive to heavy disease development. Use a minimum of 100 L/ha of water for ground application and 50 L/ha of water for aerial application. Maximum 1 application/yr. 5-day re-entry.                                                                                                  |
|                                                       | pyraclostrobin + metconazole    | Twinline        | 380–500 mL/ha<br>(150–200 mL/acre)  | Do not apply at boot stage and beyond. | Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Ensure thorough coverage of foliage. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 6-day re-entry period.                                                                                                                                            |
|                                                       | picoxystrobin                   | Acapela         | 0.44–0.88 L/ha<br>(178–356 mL/acre) | Do not apply at boot stage and beyond. | Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Use high rate and shorter interval when disease pressure is high. Optimum protection of flag leaf is provided when applied at “flag leaf out” (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha/season. 12-hr re-entry period. |
|                                                       | pyraclostrobin + fluxapyroxad   | Priaxor         | 0.225–0.3 L/ha<br>(90–120 mL/acre)  | Do not apply at boot stage and beyond. | Ground and aerial application. For optimal disease control, begin applications prior to disease development at the onset of disease symptoms. Applications should be made prior to head emergence. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                          |

## BARLEY DISEASES

**Table 4–33.** Chemical Control Options for Foliar, Stem and Head Diseases in Barley — Septoria Leaf Spot

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                               | Active Ingredient              | Trade Name     | Rate                            | PHI                                    | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|----------------|---------------------------------|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SEPTORIA LEAF SPOT (<i>Septoria tritici</i>)</b>                                                                                              |                                |                |                                 |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Foliar Treatment</b>                                                                                                                          |                                |                |                                 |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Avoid growing barley after barley, wheat or grasses in a rotation. Plow-down stubble and straw and plant early to avoid serious disease in July. | azoxystrobin + propiconazole   | Blanket AP     | 200–300 mL/ha (80–120 mL/acre)  | Do not apply at boot stage and beyond. | For commercial and on-farm treating. Apply once up to boot stage. Good spray coverage and canopy penetration are important for best results.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                                                                                                                                  |                                | Quilt          | 750 mL/ha (305 mL/acre)         | Do not apply at boot stage and beyond. | Ground and aerial application. Do not apply at boot stage and beyond. Maximum 1 application/yr. Do not harvest for forage. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                                                                                                                                  | propiconazole                  | Tilt 250 E     | 500 mL/ha (200 mL/acre)         | 45                                     | Ground and aerial application. Apply at early signs of disease from tillering to head half emerged.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                                                                                                                  |                                | Bumper 418 EC  | 300 mL/ha (121 mL/acre)         | 45                                     | <b>For use in spring barley only.</b> Ground and aerial application. Apply at early signs of disease from the beginning of stem elongation (Zadok's 29–37). If conditions favourable to disease continue, apply again, if necessary, before head is half emerged (Zadok's 49–55). Maximum 2 applications/yr.                                                                                                                                                                                                                                                                                                                                      |
|                                                                                                                                                  | prothioconazole + tebuconazole | Prosaro 250 EC | 800 mL/ha (324 mL/acre)         | 36                                     | Ground and aerial application. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                                                                                                                  | tebuconazole                   | Folicur 250 EW | 375–500 mL/ha (152–200 mL/acre) | 36                                     | Ground and aerial application. Apply at the very early stages of disease development. Use higher rate when disease pressure is severe. The use of a non-ionic surfactant (Agral 90 or Agsurf) is <b>NOT</b> required, as it is built into the formulation. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.<br><br>Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence. |
|                                                                                                                                                  |                                | Folicur 432 F  | 220–292 mL/ha (90–118 mL/acre)  | 36                                     | Ground and aerial application. Apply at the very early stages of disease development. Use higher rate when disease pressure is severe. Use non-ionic surfactant such as Agral 90 or Agsurf at 0.125% vol/vol. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.<br><br>Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.                                              |

## BARLEY DISEASES

**Table 4–33.** Chemical Control Options for Foliar, Stem and Head Diseases in Barley — Septoria Leaf Spot

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                           | Active Ingredient                  | Trade Name         | Rate                                | PHI                                                | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------------------------------------------------|------------------------------------|--------------------|-------------------------------------|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SEPTORIA LEAF SPOT (<i>Septoria tritici</i>) (cont'd)</b> |                                    |                    |                                     |                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| (cont'd)                                                     | trifloxystrobin<br>+ propiconazole | Stratego<br>250 EC | 500 mL/ha<br>(200 mL/acre)          | Do not<br>apply<br>at boot<br>stage and<br>beyond. | <b>For spring barley only.</b> Ground and aerial application. Do not apply second application within 14 days of the first. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                         |
|                                                              | pyraclostrobin<br>+ metconazole    | Twinline           | 380–500 mL/ha<br>(150–200 mL/acre)  | Do not<br>apply<br>at boot<br>stage and<br>beyond. | Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Ensure thorough coverage of foliage. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 6-day re-entry period.                                                                                                                                            |
|                                                              | picoxystrobin                      | Acapela            | 0.44–0.88 L/ha<br>(180–350 mL/acre) | Do not<br>apply<br>at boot<br>stage and<br>beyond. | Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Use high rate and shorter interval when disease pressure is high. Optimum protection of flag leaf is provided when applied at “flag leaf out” (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha/season. 12-hr re-entry period. |

## BARLEY DISEASES

**Table 4–34.** Chemical Control Options for Foliar, Stem and Head Diseases in Barley — Leaf Rust, Stem Rust

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                                                                | Active Ingredient              | Trade Name     | Rate                            | PHI                                    | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|----------------|---------------------------------|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>RUST (LEAF — <i>Puccinia hordei</i>, STEM — <i>Puccinia graminis</i> f. sp. <i>tritici</i>)</b>                                                                                                                                                                |                                |                |                                 |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Foliar Treatment</b>                                                                                                                                                                                                                                           |                                |                |                                 |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Leaf rust spores are blown in from the south, and in most years, late-planted fields are most likely to show the disease. The alternate host is barberry. Remove or destroy alternate host from fence rows, etc. Plant early to reduce risk of disease incidence. | azoxystrobin + propiconazole   | Blanket AP     | 200–300 mL (80–120 mL/acre)     | Do not apply at boot stage and beyond. | For commercial and on-farm treating. Apply once up to boot stage. Good spray coverage and canopy penetration are important for best results.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                                   | tebuconazole                   | Folicur 250 EW | 375–500 mL/ha (152–200 mL/acre) | 36                                     | Ground and aerial application. Apply at the very early stages of disease development. Use higher rate when disease pressure is severe. The use of a non-ionic surfactant (Agral 90 or Agsurf) is <b>NOT</b> required as it is built into the formulation. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.<br><br>Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence. |
|                                                                                                                                                                                                                                                                   |                                | Folicur 432 F  | 220–292 mL/ha (90–118 mL/acre)  | 36                                     | Ground and aerial application. Apply at the very early stages of disease development. Use higher rate when disease pressure is severe. Use non-ionic surfactant such as Agral 90 or Agsurf at 0.125% vol/vol. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.<br><br>Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.                                             |
|                                                                                                                                                                                                                                                                   | prothioconazole + tebuconazole | Prosaro 250 EC | 800 mL/ha (324 mL/acre)         | 36                                     | Ground and aerial application. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                                                                                                                                                                                                                                                   | azoxystrobin + propiconazole   | Quilt          | 1.0 L/ha (406 mL/acre)          | Do not apply at boot stage and beyond. | Ground and aerial application. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Use higher application rate of 1 L/ha when expecting high disease pressure from stripe rust and wheat leaf rust. Maximum 1 application/yr. Do not harvest for forage. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                                   | propiconazole                  | Tilt 250 E     | 500 mL/ha (200 mL/acre)         | 45                                     | Ground and aerial application. Apply at early signs of disease from tillering to head half emerged.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                                                                                                                                                                                                                                                   |                                | Bumper 418 EC  | 300 mL/ha (121 mL/acre)         | 45                                     | <b>For use in spring barley only.</b> Ground and aerial application. Apply at early signs of disease from the beginning of stem elongation (Zadok's 29–37). If conditions favourable to disease continue, apply again, if necessary, before head is half emerged (Zadok's 49–55). Maximum 2 applications/yr.                                                                                                                                                                                                                                                                                                                                     |

## BARLEY DISEASES

**Table 4–34.** Chemical Control Options for Foliar, Stem and Head Diseases in Barley — Leaf Rust, Stem Rust

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                   | Active Ingredient | Trade Name | Rate                               | PHI                                    | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                               |
|------------------------------------------------------------------------------------------------------|-------------------|------------|------------------------------------|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>RUST (LEAF — <i>Puccinia hordei</i>, STEM — <i>Puccinia graminis f. sp. tritici</i>) (cont'd)</b> |                   |            |                                    |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| (cont'd)                                                                                             | metconazole       | Caramba    | 1 L/ha<br>(0.4 L/acre)             | 30                                     | <b>Provides suppression only.</b> Ground and aerial application. Timing of application is critical. Apply at 20% flowering (Zadok's 61–63) using sprayer nozzles configured to provide excellent coverage of the cereal head. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 5-day re-entry period.                                                                                                 |
|                                                                                                      | penthiopyrad      | Vertisan   | 1.2–1.75 L/ha<br>(0.48–0.7 L/acre) | Do not apply at boot stage and beyond. | Ground and aerial application. Begin applications prior to disease development and continue on a 7–14-day interval. Use higher rate and shorter interval when disease pressure is high. To optimize flag leaf protection, apply at “flag leaf out” (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Do not apply more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 3.5 L/ha/yr. 12-hr re-entry period. |

## BARLEY DISEASES

**Table 4–35.** Chemical Control Options for Foliar, Stem and Head Diseases in Barley — Stripe Rust, Fusarium Head Blight

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                 | Active Ingredient              | Trade Name     | Rate                             | PHI                                    | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|----------------|----------------------------------|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>STRIPE RUST (<i>Puccinia striiformis</i> f. sp. <i>hordei</i>)</b>                                                                                                                                                                                                                                                                                                                                                                              |                                |                |                                  |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Foliar Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                            |                                |                |                                  |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| This disease is most noticeable in seasons with a prolonged cool spring (3°C–15°C). Symptoms often disappear as temperatures increase.                                                                                                                                                                                                                                                                                                             | azoxystrobin + propiconazole   | Blanket AP     | 200–300 mL/ha (80–120 mL/acre)   | Do not apply at boot stage and beyond. | For commercial and on-farm treating. Apply once up to boot stage. Good spray coverage and canopy penetration are important for best results.                                                                                                                                                                                                                                                                                                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                    | pyraclostrobin + metconazole   | Twinline       | 380–500 mL/ha (150–200 mL/acre)  | Do not apply at boot stage and beyond. | Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Ensure thorough coverage of foliage. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 6-day re-entry period.                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                    | picoxystrobin                  | Acapela        | 0.44–0.88 L/ha (178–356 mL/acre) | Do not apply at boot stage and beyond. | Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Use high rate and shorter interval when disease pressure is high. Optimum protection of flag leaf is provided when applied at “flag leaf out” (Zadok’s 39). Do not apply at boot stage (Zadok’s 47) and beyond. Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha/season. 12-hr re-entry period |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                    | pyraclostrobin + fluxapyroxad  | Priaxor        | 0.225–0.3 L/ha (90–120 mL/acre)  | Do not apply at boot stage and beyond. | Ground and aerial application. For optimal disease control, begin applications prior to disease development at the onset of disease symptoms. Applications should be made prior to head emergence. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                         |
| <b>FUSARIUM HEAD BLIGHT (<i>Fusarium graminearum</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                          |                                |                |                                  |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Fusarium head blight infection in barley is often not as noticeable as in wheat, so examine developing heads carefully for bleached or tan spikelets. Avoid planting barley into corn residue.<br><br>For information on this disease, see Table 4–18. Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — <i>Fusarium Head Blight</i> , on page 87, as well as OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> . | metconazole                    | Caramba        | 1 L/ha (0.4 L/acre)              | 30                                     | <b>Provides suppression only.</b> Ground and aerial application. Timing of application is critical. Apply at 20% flowering (Zadok’s 61–63) using sprayer nozzles configured to provide excellent coverage of the cereal head. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 5-day re-entry period.                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                    | prothioconazole + tebuconazole | Prosaro 250 EC | 800 mL/ha (324 mL/acre)          | 36                                     | <b>Provides suppression only.</b> Ground and aerial application. Timing of application is critical. For optimum suppression, apply as a preventive spray from when 70%–100% of the barley main stem heads are fully emerged to 3 days after full head emergence. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                    | prothioconazole                | Proline 480 SC | 315–420 mL/ha (128–170 mL/acre)  | 30                                     | <b>Provides suppression only.</b> Ground and aerial application. Timing is critical. For optimum suppression, apply as a preventive spray from when 70%–100% of the barley main stem heads are fully emerged to 3 days after full head emergence. Maximum 2 applications/yr (735 mL/ha) with a minimum 7-day interval between applications. 24-hr re-entry period.                                                                                                                   |

## BARLEY DISEASES

**Table 4–36.** Chemical Control Options for Seed and Seedling Diseases in Barley — Seed-Borne Septoria

| Integrated Pest Management Options                                                                                                                                                                    | Active Ingredient                          | Trade Name     | Rate                   | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|----------------|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SEED-BORNE SEPTORIA</b>                                                                                                                                                                            |                                            |                |                        |                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Seed Treatment</b>                                                                                                                                                                                 |                                            |                |                        |                                                                                                                                                                                                                                                                                                                                                                                                      |
| Sow into a well-prepared seedbed under good growing conditions. Avoid cool, wet conditions that will reduce emergence and increase seed rots and blights. Treat seed with a fungicide seed treatment. | tebuconazole + thiram                      | Raxil T        | 225 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                                                                                                                                                                                                                         |
|                                                                                                                                                                                                       | tebuconazole + metalaxyl                   | Raxil MD       | 300 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provides good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting. |
|                                                                                                                                                                                                       | carbathiin + thiram                        | Vitaflo 280    | 230–330 mL/100 kg seed | <b>For use in commercial seed treatment facilities only.</b> Do not graze or feed livestock on treated areas for 6 weeks after planting.                                                                                                                                                                                                                                                             |
|                                                                                                                                                                                                       | triticonazole + thiram                     | Gemini         | 360 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder.                                                                                                                                                                                                                      |
|                                                                                                                                                                                                       | ipconazole                                 | Rancona Apex   | 325–433 mL/100 kg seed | For commercial and on-farm treating. Use higher rate for highly infected seed lots only. Do not graze or feed livestock on treated areas for 30 days after planting.                                                                                                                                                                                                                                 |
|                                                                                                                                                                                                       | penflufen + prothioconazole + metalaxyl    | EverGol Energy | 65 mL/100 kg seed      | For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.                                                                                                   |
|                                                                                                                                                                                                       | tebuconazole + prothioconazole + metalaxyl | Raxil Pro MD   | 325 mL/100 kg seed     | Use only in treating equipment that can accurately control application rates and provide good distribution of the chemical onto the seed in the mixing chamber. Uniform application to seed is necessary to ensure best disease protection and seed safety. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                              |
|                                                                                                                                                                                                       | difenoconazole + metalaxyl-M + sedaxane    | Vibrance XL    | 180–360 mL/100 kg seed | <b>For use in commercial seed treatment facilities only.</b> For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.                                                                    |

## BARLEY DISEASES

**Table 4–37.** Chemical Control Options for Foliar, Stem and Head Diseases in Barley — Powdery Mildew

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                         | Active Ingredient                  | Trade Name      | Rate                                | PHI                                    | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-----------------|-------------------------------------|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>POWDERY MILDEW (<i>Erysiphe graminis</i>)</b>                                                                                                                                           |                                    |                 |                                     |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Foliar fungicide applications may be necessary if disease levels will result in yield losses and a susceptible variety has been used. Consult with your seed company for variety profiles. | propiconazole                      | Bumper 418 EC   | 300 mL/ha<br>(121 mL/acre)          | 45                                     | <b>For use in spring barley only.</b> Ground and aerial application. Apply at early signs of disease from the beginning of stem elongation (Zadok's 29–37). If conditions favourable to disease continue, apply again, if necessary, before head is half emerged (Zadok's 49–55). Maximum 2 applications/yr.                                                                                                                                                                                                                                                                                                                                                                                                                  |
|                                                                                                                                                                                            | tebuconazole                       | Folicur 250 EW  | 375–500 mL/ha<br>(152–200 mL/acre)  | 36                                     | Ground and aerial application. Apply to leaf foliage at the first sign or very early stage of disease, especially if weather conditions are conducive to disease development, up to the end of the flowering stage. The use of a non-ionic surfactant (Agral 90 or Agsurf) is <b>NOT</b> required as it is built into the formulation. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.<br><br>Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence. |
|                                                                                                                                                                                            |                                    | Folicur 432 F   | 220–292 mL/ha<br>(90–118 mL/acre)   | 36                                     | Ground and aerial application. Apply at the very early stages of disease development. Use higher rate when disease pressure is severe. Use non-ionic surfactant such as Agral 90 or Agsurf at 0.125% vol/vol. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.<br><br>Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.                                                                                                                          |
|                                                                                                                                                                                            | trifloxystrobin<br>+ propiconazole | Stratego 250 EC | 500 mL/ha<br>(200 mL/acre)          | Do not apply at boot stage and beyond. | Ground and aerial application. Do not apply the second application within 14 days of the first. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                                                                                                                                                                            | prothioconazole<br>+ tebuconazole  | Prosaro 250 EC  | 800 mL/ha<br>(324 mL/acre)          | 36                                     | Ground and aerial application. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                            | picoxystrobin                      | Acapela         | 0.44–0.88 L/ha<br>(180–350 mL/acre) | Do not apply at boot stage and beyond. | Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Use high rate and shorter interval when disease pressure is high. Optimum protection of flag leaf is provided when applied at “flag leaf out” (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha/season. 12-hr re-entry period.                                                                                                                                                                                                                                         |

## OAT DISEASES

**Table 4–38.** Chemical Control Options for Seed and Seedling Diseases in Oat — Seed Rot, Seedling Blight

| Integrated Pest Management Options                                                                                                                              | Active Ingredient                          | Trade Name      | Rate                   | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-----------------|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SEED ROT and SEEDLING BLIGHT (<i>Pyrenopeziza avenae</i>, <i>Fusarium</i> spp. and others)</b>                                                               |                                            |                 |                        |                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Seed Treatment</b>                                                                                                                                           |                                            |                 |                        |                                                                                                                                                                                                                                                                                                                                                                                                      |
| Ensure good coverage of seed treatment on seeds. Rotation with non-host crops for at least 2 yr will reduce risk. Use disease-free seed and avoid deep seeding. | carbathiin + thiram                        | Vitaflo 280     | 330 mL/100 kg seed     | <b>For use in commercial seed treatment facilities only.</b> Do not graze or feed livestock on treated areas for 6 weeks after planting.                                                                                                                                                                                                                                                             |
|                                                                                                                                                                 | difenoconazole + metalaxyl-M               | Dividend XL RTA | 325–650 mL/100 kg seed | For both commercial seed treatment plants and on-farm treatment, using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 35 days of planting.                                                                                                                                          |
|                                                                                                                                                                 | ipconazole                                 | Rancona Apex    | 325 mL/100 kg seed     | For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 30 days after planting.                                                                                                                                                                                                                                                                                     |
|                                                                                                                                                                 | tebuconazole + metalaxyl-M                 | Raxil MD        | 300 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provides good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting. |
|                                                                                                                                                                 | penflufen + prothioconazole + metalaxyl    | EverGol Energy  | 65 mL/100 kg seed      | <b>For commercial seed treating only.</b> May be tank-mixed but see the registered label of the tank-mix partner for application rates, precautions and directions.                                                                                                                                                                                                                                  |
|                                                                                                                                                                 | tebuconazole + prothioconazole + metalaxyl | Raxil Pro MD    | 325 mL/100 kg seed     | Use only in treating equipment that can accurately control application rates and provide good distribution of the chemical onto the seed in the mixing chamber. Uniform application to seed is necessary to ensure best disease protection and seed safety. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                              |
|                                                                                                                                                                 | difenoconazole + metalaxyl-M + sedaxane    | Vibrance XL     | 180–360 mL/100 kg seed | <b>For use in commercial seed treatment facilities only.</b> For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.                                                                    |

## OAT DISEASES

**Table 4–39.** Chemical Control Options for Seed and Seedling Diseases in Oat — Covered Smut (Common Bunt), Loose Smut, Aspergillus

| Integrated Pest Management Options                                                                                                                                                                                                                         | Active Ingredient                          | Trade Name      | Rate                   | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-----------------|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>COVERED SMUT (COMMON BUNT) (<i>Ustilago kollerii</i>), LOOSE SMUT (<i>Ustilago avenae</i>)</b>                                                                                                                                                          |                                            |                 |                        |                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                      |                                            |                 |                        |                                                                                                                                                                                                                                                                                                                                                                                                      |
| This disease is spread from year to year primarily through infected seed. Wind-blown spores will infect florets within season. Use pedigreed seed that is treated with a fungicide seed treatment.                                                         | carbathiin + thiram                        | Vitaflo 280     | 330 mL/100 kg seed     | <b>For use in commercial seed treatment facilities only.</b> Do not graze or feed livestock on treated areas for 6 weeks after planting.                                                                                                                                                                                                                                                             |
|                                                                                                                                                                                                                                                            | difenoconazole + metalaxyl-M               | Dividend XL RTA | 325–650 mL/100 kg seed | For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 35 days of planting.                                                                                                                                           |
|                                                                                                                                                                                                                                                            | triticonazole + thiram                     | Gemini          | 360 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder.                                                                                                                                                                                                                      |
|                                                                                                                                                                                                                                                            | tebuconazole + thiram                      | Raxil T         | 225 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment. <b>For loose smut control only.</b> Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                            | tebuconazole + metalaxyl-M                 | Raxil MD        | 300 mL/100 kg seed     | For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provides good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting. |
|                                                                                                                                                                                                                                                            | ipconazole                                 | Rancona Apex    | 325 mL/100 kg seed     | For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 30 days after planting.                                                                                                                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                            | penflufen + prothioconazole + metalaxyl    | EverGol Energy  | 65 mL/100 kg seed      | For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.                                                                                                   |
|                                                                                                                                                                                                                                                            | tebuconazole + prothioconazole + metalaxyl | Raxil Pro MD    | 325 mL/100 kg seed     | Use only in treating equipment that can accurately control application rates and provide good distribution of the chemical onto the seed in the mixing chamber. Uniform application to seed is necessary to ensure best disease protection and seed safety. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                              |
|                                                                                                                                                                                                                                                            | difenoconazole + metalaxyl-M + sedaxane    | Vibrance XL     | 180–360 mL/100 kg seed | <b>For use in commercial seed treatment facilities only.</b> For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.                                                                    |
| <b>ASPERGILLUS (<i>Aspergillus</i> spp.)</b>                                                                                                                                                                                                               |                                            |                 |                        |                                                                                                                                                                                                                                                                                                                                                                                                      |
| Sow into a well-prepared seed bed under good growing conditions. Avoid cool, wet conditions that will reduce emergence and increase seed rots and blights. Treat seed with a fungicide seed treatment and ensure good coverage of seed treatment on seeds. | tebuconazole + prothioconazole + metalaxyl | Raxil Pro MD    | 325 mL/100 kg seed     | Use only in treating equipment that can accurately control application rates and provide good distribution of the chemical onto the seed in the mixing chamber. Uniform application to seed is necessary to ensure best disease protection and seed safety. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                              |

## OAT DISEASES

**Table 4–40.** Chemical Control Options for Seed and Seedling Diseases in Oat — Common Root Rot, Rhizoctonia, Pythium Damping-Off

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                  | Active Ingredient                                | Trade Name         | Rate                       | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|--------------------|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>COMMON ROOT ROT (<i>Cochliobolus</i>)</b>                                                                                                                                                                                                                                                                        |                                                  |                    |                            |                                                                                                                                                                                                                                                                                                                                                                                                     |
| Sow into a well-prepared seed bed under good growing conditions. Avoid cool, wet conditions that will reduce emergence and increase seed rots and blights. Treat seed with a fungicide seed treatment and ensure good coverage of seed treatment on seeds.                                                          | tebuconazole<br>+ prothioconazole<br>+ metalaxyl | Raxil Pro MD       | 325 mL/<br>100 kg seed     | Use only in treating equipment that can accurately control application rates and provide good distribution of the chemical onto the seed in the mixing chamber. Uniform application to seed is necessary to ensure best disease protection and seed safety. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                             |
| <b>RHIZOCTONIA (<i>Rhizoctonia solani</i>)</b>                                                                                                                                                                                                                                                                      |                                                  |                    |                            |                                                                                                                                                                                                                                                                                                                                                                                                     |
| Sow into a well-prepared seed bed under good growing conditions. Avoid cool, wet conditions that will reduce emergence and increase seed rots and blights. Treat seed with a fungicide seed treatment and ensure good coverage of seed treatment on seeds.                                                          | difenoconazole<br>+ metalaxyl-M<br>+ sedaxane    | Vibrance XL        | 180–360 mL/<br>100 kg seed | <b>For use in commercial seed treatment facilities only.</b> For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.                                                                   |
| <b>PYTHIUM DAMPING-OFF (<i>Pythium</i> spp.)</b>                                                                                                                                                                                                                                                                    |                                                  |                    |                            |                                                                                                                                                                                                                                                                                                                                                                                                     |
| This disease can occur on all soil types but losses are greatest in cold, wet clay soils. Minimize soil compaction and remove excess moisture through improved drainage. Seed treatments containing metalaxyl-M can reduce infection. Delay planting until conditions will result in a rapid and uniform emergence. | carbathiin<br>+ thiram                           | Vitaflo 280        | 330 mL/<br>100 kg seed     | <b>For use in commercial seed treatment facilities only.</b> Do not graze or feed livestock on treated areas for 6 weeks after planting.                                                                                                                                                                                                                                                            |
|                                                                                                                                                                                                                                                                                                                     | difenoconazole<br>+ metalaxyl-M                  | Dividend XL<br>RTA | 325–650 mL/<br>100 kg seed | For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 35 days of planting.                                                                                                                                          |
|                                                                                                                                                                                                                                                                                                                     | tebuconazole<br>+ metalaxyl-M                    | Raxil MD           | 300 mL/<br>100 kg seed     | For both commercial seed treatment plants and on-farm treatment with conventional seed-treating equipment that can accurately control application rates and provide good distribution of chemical onto the seed in the mixing chamber. Uniform application is necessary to ensure seed safety and best disease control. Do not graze or feed livestock on treated areas for 4 weeks after planting. |
|                                                                                                                                                                                                                                                                                                                     | tebuconazole<br>+ thiram                         | Raxil T            | 225 mL/<br>100 kg seed     | For both commercial seed treatment plants and on-farm treatment. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                                                                                                                                                                                                                        |
|                                                                                                                                                                                                                                                                                                                     | penflufen<br>+ prothioconazole<br>+ metalaxyl    | EverGol Energy     | 65 mL/<br>100 kg seed      | For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.                                                                                                  |
|                                                                                                                                                                                                                                                                                                                     | tebuconazole<br>+ prothioconazole<br>+ metalaxyl | Raxil Pro MD       | 325 mL/<br>100 kg seed     | Use only in treating equipment that can accurately control application rates and provide good distribution of the chemical onto the seed in the mixing chamber. Uniform application to seed is necessary to ensure best disease protection and seed safety. Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                             |
|                                                                                                                                                                                                                                                                                                                     | difenoconazole<br>+ metalaxyl-M<br>+ sedaxane    | Vibrance XL        | 180–360 mL/<br>100 kg seed | <b>For use in commercial seed treatment facilities only.</b> For seed treated with Vibrance XL seed treatment, do not graze or feed livestock on treated areas for 45 days after planting. For seed treated with Vibrance XL fungicide seed treatment alone, a seed colourant must be added when this product is applied to seed.                                                                   |

## OAT DISEASES

**Table 4–41.** Chemical Control Options for Foliar, Stem and Head Diseases in Oat — Crown (Leaf) Rust**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Active Ingredient                  | Trade Name      | Rate                               | PHI                                                | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|-----------------|------------------------------------|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CROWN (LEAF) RUST (<i>Puccinia coronata</i> var. <i>avenae</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                    |                 |                                    |                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Foliar Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                    |                 |                                    |                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| European buckthorn is the alternate host for this disease. Remove or destroy buckthorn where possible. Crown rust can be a problem in central and eastern Ontario. Use resistant oat varieties. Consult with your seed company and the Ontario Cereal Crops Committee Variety Trial Results at <a href="http://www.gocereals.ca">www.gocereals.ca</a> for variety profiles. Plant oat early to allow plants to mature before inoculum levels are high. Observe fields closely for early disease symptoms, particularly when susceptible varieties are planted and/or under prolonged conditions that favour disease development. These conditions include mild-to-warm temperatures (20°C–25°C) during the day and mild temperatures at nights (15°C–20°C) with adequate moisture (rains, frequent dews). | tebuconazole                       | Folicur 250 EW  | 375 mL/ha<br>(152 mL/acre)         | 36                                                 | Ground and aerial application. Apply to leaf foliage at the first sign or very early stage of disease, especially if weather conditions are conducive to disease development, up to the end of the flowering stage. The use of a non-ionic surfactant (Agral 90 or Agsurf) is <b>NOT</b> required as it is built into the formulation. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.<br><br>Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                    | Folicur 432 F   | 220 mL/ha<br>(90 mL/acre)          | 36                                                 | Ground and aerial application. Apply at the very early stages of disease development. Use higher rate when disease pressure is severe. Use non-ionic surfactant such as Agral 90 or Agsurf at 0.125% vol/vol. Use a minimum of 100 L/ha of water for ground application, 47 L/ha of water for aerial application. Maximum 1 application/yr. 12-hr re-entry period.<br><br>Before using Folicur for control of leaf diseases, consider that Folicur can only be applied once per year and has been traditionally used for <i>Fusarium</i> control, where applications are targeted at head emergence.                                                                                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | propiconazole                      | Tilt 250 E      | 500 mL/ha<br>(200 mL/acre)         | 45                                                 | Ground and aerial application. Apply at early signs of disease from tillering to head half emerged.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                    | Bumper 418 EC   | 300 mL/ha<br>(121 mL/acre)         | 45                                                 | Ground and aerial application. Apply at early signs of disease from the beginning of stem elongation (Zadok's 29–37). If conditions favourable to disease continue, apply again, if necessary, before head is half emerged (Zadok's 49–55). Maximum 2 applications/yr.                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | trifloxystrobin<br>+ propiconazole | Stratego 250 EC | 500 mL/ha<br>(200 mL/acre)         | Do not<br>apply<br>at boot<br>stage and<br>beyond. | Ground and aerial application. Do not apply the second application within 14 days of the first. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | pyraclostrobin                     | Headline EC     | 300–400 mL/ha<br>(121–160 mL/acre) | Do not<br>apply<br>at boot<br>stage and<br>beyond. | Ground and aerial application. For optimal disease control, apply immediately after flag leaf emergence (Zadok's 37). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

## OAT DISEASES

**Table 4–41.** Chemical Control Options for Foliar, Stem and Head Diseases in Oat — Crown (Leaf) Rust**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                              | Active Ingredient                 | Trade Name     | Rate                                | PHI                                                | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------------------------------------------------------|-----------------------------------|----------------|-------------------------------------|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>CROWN (LEAF) RUST (<i>Puccinia coronata</i> var. <i>avenae</i>) (cont'd)</b> |                                   |                |                                     |                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| (cont'd)                                                                        | prothioconazole                   | Proline 480 SC | 260 mL/ha<br>(105 mL/acre)          | 30                                                 | Ground and aerial application. Apply as a preventive treatment when the earliest disease symptoms appear on the leaves and stems. Apply with a non-ionic surfactant such as Agral 90 or Agsurf at 0.125% vol/vol. Minimum of 7 days application interval. Maximum 2 applications/yr. 24-hr re-entry period.                                                                                                                                                                           |
|                                                                                 | metconazole                       | Caramba        | 500–700 mL/ha<br>(200–280 mL/acre)  | 30                                                 | Ground and aerial application. Apply to leaf foliage at the first sign or very early stage of disease up to the end of the flowering stage. Use the higher rate when weather conditions are conducive to heavy disease development. Use a minimum of 100 L/ha of water for ground application and 50 L/ha of water for aerial application. Maximum 1 application/yr. 5-day re-entry.                                                                                                  |
|                                                                                 | pyraclostrobin<br>+ metconazole   | Twinline       | 380–500 mL/ha<br>(150–200 mL/acre)  | Do not<br>apply<br>at boot<br>stage and<br>beyond. | Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Ensure thorough coverage of foliage. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 6 day re-entry period.                                                                                                                                            |
|                                                                                 | picoxystrobin                     | Acapela        | 0.44–0.88 L/ha<br>(178–356 mL/acre) | Do not<br>apply<br>at boot<br>stage and<br>beyond. | Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Use high rate and shorter interval when disease pressure is high. Optimum protection of flag leaf is provided when applied at “flag leaf out” (Zadok’s 39). Do not apply at boot stage (Zadok’s 47) and beyond. Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha/season. 12-hr re-entry period. |
|                                                                                 | prothioconazole<br>+ tebuconazole | Prosaro 250 EC | 800 mL/ha<br>(324 mL/acre)          | 36                                                 | Ground and aerial application. Use a minimum of 100 L/ha of water for ground application. Maximum 1 application per year. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                      |
|                                                                                 | pyraclostrobin<br>+ fluxapyroxad  | Priaxor        | 0.225–0.3 L/ha<br>(90–120 mL/acre)  | Do not<br>apply<br>at boot<br>stage and<br>beyond. | Ground and aerial application. For optimal disease control, begin applications prior to disease development at the onset of disease symptoms. Applications should be made prior to head emergence. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                          |

## OAT DISEASES

**Table 4–42.** Chemical Control Options for Foliar, Stem and Head Diseases in Oat — Septoria Leaf Spot, Septoria Leaf Blotch, Fusarium Head Blight, Stem Rust**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                           | Active Ingredient               | Trade Name      | Rate                               | PHI                                    | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|-----------------|------------------------------------|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SEPTORIA LEAF SPOT (<i>Septoria tritici</i>) and SEPTORIA LEAF BLOTCH (<i>Stagonospora avenae</i> f. sp. <i>avenaria</i> (<i>Septoria avenae</i>))</b>                                                                                                                                                                    |                                 |                 |                                    |                                        |                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Foliar Treatment</b>                                                                                                                                                                                                                                                                                                      |                                 |                 |                                    |                                        |                                                                                                                                                                                                                                                                                                                                                                                      |
| Avoid planting oat after oat or mixed grains. Humid, wet, windy weather promotes this disease.                                                                                                                                                                                                                               | propiconazole                   | Tilt 250 E      | 500 mL/ha<br>(200 mL/acre)         | 45                                     | Ground and aerial application. Apply at early signs of disease from tillering to head half emerged.                                                                                                                                                                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                                              |                                 | Bumper 418 EC   | 300 mL/ha<br>(121 mL/acre)         | 45                                     | Ground and aerial application. Apply at early signs of disease from the beginning of stem elongation (Zadok's 29–37). If conditions favourable to disease continue, apply again, before head is half emerged (Zadok's 49–55). Can be tank-mixed with several cereal herbicides. Maximum 2 applications/yr.                                                                           |
|                                                                                                                                                                                                                                                                                                                              | pyraclostrobin + metconazole    | Twinline        | 380–500 mL/ha<br>(150–200 mL/acre) | Do not apply at boot stage and beyond. | Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Ensure thorough coverage of foliage. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 6-day re-entry period.                                           |
|                                                                                                                                                                                                                                                                                                                              | trifloxystrobin + propiconazole | Stratego 250 EC | 500 mL/ha<br>(200 mL/acre)         | Do not apply at boot stage and beyond. | Ground and aerial application. Do not apply the second application within 14 days of the first. Apply only up to flag leaf fully emerged stage (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                              | metconazole                     | Caramba         | 500–700 mL/ha<br>(200–280 mL/acre) | 30                                     | Ground and aerial application. Apply to leaf foliage at the first sign or very early stage of disease up to the end of the flowering stage. Use the higher rate when weather conditions are conducive to heavy disease development. Use a minimum of 100 L/ha of water for ground application and 50 L/ha of water for aerial application. Maximum 1 application/yr. 5-day re-entry. |
| <b>FUSARIUM HEAD BLIGHT (<i>Fusarium graminearum</i>)</b>                                                                                                                                                                                                                                                                    |                                 |                 |                                    |                                        |                                                                                                                                                                                                                                                                                                                                                                                      |
| For information on this disease, see Table 4–18. Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Fusarium Head Blight, on page 87, as well as OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> .                                                                                         | metconazole                     | Caramba         | 1 L/ha<br>(400 mL/acre)            | 30                                     | <b>Provides suppression only.</b> Ground and aerial application. Timing of application is critical. Apply at 20% flowering (Zadok's 61–63) using sprayer nozzles configured to provide excellent coverage of the cereal head. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 5-day re-entry period.   |
|                                                                                                                                                                                                                                                                                                                              | prothioconazole + tebuconazole  | Prosaro 250 EC  | 800 mL/ha<br>(324 mL/acre)         | 36                                     | Ground and aerial application. Use a minimum of 100 L/ha of water for ground application. Maximum 1 application per year. 12-hr re-entry period.                                                                                                                                                                                                                                     |
| <b>STEM RUST (<i>Puccinia graminis</i>)</b>                                                                                                                                                                                                                                                                                  |                                 |                 |                                    |                                        |                                                                                                                                                                                                                                                                                                                                                                                      |
| Stem rust begins as dark reddish-brown spots on both sides of the leaves, stems and heads. When developed, spots will rupture through the surface, releasing spores into the air. The surface of the tissue appears ragged and torn. Removal of alternate host, barberry and the use of resistant varieties can reduce risk. | prothioconazole + tebuconazole  | Prosaro 250 EC  | 800 mL/ha<br>(324 mL/acre)         | 36                                     | Ground and aerial application. Use a minimum of 100 L/ha of water for ground application. Maximum 1 application/yr. 12-hr re-entry period.                                                                                                                                                                                                                                           |

## RYE DISEASES

**Table 4–43.** Chemical Control Options for Diseases in Rye — Seedling Blight, Pythium Damping-Off, Seed-Borne Septoria, Common Bunt, Dwarf Bunt

| Integrated Pest Management Options                                                                                                                                                                    | Active Ingredient            | Trade Name      | Rate                   | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                       |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-----------------|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SEEDLING BLIGHT (<i>Pythium</i> spp., <i>Rhizoctonia</i> spp., <i>Fusarium</i> spp.)</b>                                                                                                           |                              |                 |                        |                                                                                                                                                                                                                                                            |
| <b>Seed Treatment</b>                                                                                                                                                                                 |                              |                 |                        |                                                                                                                                                                                                                                                            |
| Sow into a well-prepared seedbed under good growing conditions. Avoid cool, wet conditions that will reduce emergence and increase seed rots and blights. Treat seed with a fungicide seed treatment. | carbathiin + thiram          | Vitaflo 280     | 230–330 mL/100 kg seed | <b>For use in commercial seed treatment facilities only.</b> Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                                                                                   |
|                                                                                                                                                                                                       | difenoconazole + metalaxyl-M | Dividend XL RTA | 325–650 mL/100 kg seed | For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 35 days of planting. |
|                                                                                                                                                                                                       | ipconazole                   | Rancona Apex    | 325 mL/100 kg seed     | <b>For fusarium control only.</b> For commercial and on-farm treating. Do not graze or feed livestock on treated areas for 30 days after planting.                                                                                                         |
| <b>PYTHIUM DAMPING-OFF (<i>Pythium</i> spp.)</b>                                                                                                                                                      |                              |                 |                        |                                                                                                                                                                                                                                                            |
| <b>Seed Treatment</b>                                                                                                                                                                                 |                              |                 |                        |                                                                                                                                                                                                                                                            |
| Sow into a well-prepared seedbed under good growing conditions. Avoid cool, wet conditions that will reduce emergence and increase seed rots and blights. Treat seed with a fungicide seed treatment. | carbathiin + thiram          | Vitaflo 280     | 230–330 mL/100 kg seed | Do not graze or feed livestock on treated areas for 4 weeks after planting.                                                                                                                                                                                |
|                                                                                                                                                                                                       | difenoconazole + metalaxyl-M | Dividend XL RTA | 325–650 mL/100 kg seed | For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 35 days of planting. |
| <b>SEED-BORNE SEPTORIA (<i>Septoria</i> spp.)</b>                                                                                                                                                     |                              |                 |                        |                                                                                                                                                                                                                                                            |
| <b>Seed Treatment</b>                                                                                                                                                                                 |                              |                 |                        |                                                                                                                                                                                                                                                            |
| Sow into a well-prepared seedbed under good growing conditions. Avoid cool, wet conditions that will reduce emergence and increase seed rots and blights. Treat seed with a fungicide seed treatment. | difenoconazole + metalaxyl-M | Dividend XL RTA | 325–650 mL/100 kg seed | For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 35 days of planting. |
| <b>COMMON BUNT (<i>Tilletia caries</i>), DWARF BUNT (<i>Tilletia controversa</i>)</b>                                                                                                                 |                              |                 |                        |                                                                                                                                                                                                                                                            |
| <b>Seed Treatment</b>                                                                                                                                                                                 |                              |                 |                        |                                                                                                                                                                                                                                                            |
| Sow into a well-prepared seedbed under good growing conditions. Avoid cool, wet conditions that will reduce emergence and increase seed rots and blights. Treat seed with a fungicide seed treatment. | difenoconazole + metalaxyl-M | Dividend XL RTA | 325–650 mL/100 kg seed | For both commercial seed treatment plants and on-farm treatment using standard gravity flow- or mist-type seed treatment equipment. May also be used in treat-on-the-go seeder. Do not graze, feed green forage or cut for hay within 35 days of planting. |

## RYE DISEASES

**Table 4–44.** Chemical Control Options for Diseases in Rye — Leaf Rust

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                                                  | Active Ingredient             | Trade Name  | Rate                                | PHI                                    | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-------------|-------------------------------------|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>LEAF RUST (<i>Puccinia recondita</i> f. sp. <i>recondita</i>)</b>                                                                                                                                                                                |                               |             |                                     |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Foliar Treatment</b>                                                                                                                                                                                                                             |                               |             |                                     |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <p>Leaf rust in rye is caused by the same fungus that infects wheat.</p> <p>See Table 4–16. <i>Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Leaf Rust, Stem Rust</i>, on page 82, for management options and details.</p> | pyraclostrobin                | Headline EC | 300–600 mL/ha<br>(120–240 mL/acre)  | Do not apply at boot stage and beyond. | Ground and aerial application. For optimal disease control, apply immediately after flag leaf emergence (Zadok's 37). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                     | pyraclostrobin + metconazole  | Twinline    | 380–500 mL/ha<br>(150–200 mL/acre)  | Do not apply at boot stage and beyond. | Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Ensure thorough coverage of foliage. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 6 day re-entry period.                                                                                                                                            |
|                                                                                                                                                                                                                                                     | picoxystrobin                 | Acapela     | 0.44–0.88 L/ha<br>(180–350 mL/acre) | Do not apply at boot stage and beyond. | Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Use high rate and shorter interval when disease pressure is high. Optimum protection of flag leaf is provided when applied at “flag leaf out” (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha/season. 12-hr re-entry period. |
|                                                                                                                                                                                                                                                     | metconazole                   | Caramba     | 500–700 mL/ha<br>(200–280 mL/acre)  | 30                                     | Ground and aerial application. Apply to leaf foliage at the first sign or very early stage of disease up to the end of the flowering stage. Use the higher rate when weather conditions are conducive to heavy disease development. Use a minimum of 100 L/ha of water for ground application and 50 L/ha of water for aerial application. Maximum 1 application/yr. 5-day re-entry.                                                                                                  |
|                                                                                                                                                                                                                                                     | penthiopyrad                  | Vertisan    | 1.2–1.75 L/ha<br>(0.48–0.7 L/acre)  | Do not apply at boot stage and beyond. | Ground and aerial application. Begin applications prior to disease development and continue on a 7–14-day interval. Use higher rate and shorter interval when disease pressure is high. To optimize flag leaf protection, apply at “flag leaf out” (Zadok's 39). Do not apply after flowering (Zadok's 59). Do not apply more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 3.5 L/ha/yr. 12-hr re-entry period.             |
|                                                                                                                                                                                                                                                     | pyraclostrobin + fluxapyroxad | Priaxor     | 0.225–0.3 L/ha<br>(90–120 mL/acre)  | Do not apply at boot stage and beyond. | Ground and aerial application. For optimal disease control, begin applications prior to disease development at the onset of disease symptoms. Applications should be made prior to head emergence. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                          |

## RYE DISEASES

**Table 4–45.** Chemical Control Options for Diseases in Rye — Powdery Mildew, Fusarium Head Blight

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                                | Active Ingredient             | Trade Name  | Rate                                | PHI                                    | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|-------------|-------------------------------------|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>POWDERY MILDEW (<i>Erysiphe graminis</i> f. sp. <i>secalis</i>)</b>                                                                                                                                                            |                               |             |                                     |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Foliar Treatment</b>                                                                                                                                                                                                           |                               |             |                                     |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| In most cases, powdery mildew has little impact on rye since the crop is very resistant to the disease.                                                                                                                           | pyraclostrobin                | Headline EC | 400–600 mL/ha<br>(160–240 mL/acre)  | Do not apply at boot stage and beyond. | Ground and aerial application. For optimal disease control, apply immediately after flag leaf emergence (Zadok's 37). Do not apply at boot stage (Zadok's 47) and beyond. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                   | metconazole                   | Caramba     | 500–700 mL/ha<br>(200–280 mL/acre)  | 30                                     | Ground and aerial application. Apply to leaf foliage at the first sign or very early stage of disease up to the end of the flowering stage. Use the higher rate when weather conditions are conducive to heavy disease development. Use a minimum of 100 L/ha of water for ground application and 50 L/ha of water for aerial application. Maximum 1 application/yr. 5-day re-entry.                                                                                                  |
|                                                                                                                                                                                                                                   | pyraclostrobin + metconazole  | Twinline    | 380–500 mL/ha<br>(150–200 mL/acre)  | Do not apply at boot stage and beyond. | Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Ensure thorough coverage of foliage. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 6-day re-entry period.                                                                                                                                            |
|                                                                                                                                                                                                                                   | pyraclostrobin + fluxapyroxad | Priaxor     | 0.225–0.3 L/ha<br>(90–120 mL/acre)  | Do not apply at boot stage and beyond. | Ground and aerial application. For optimal disease control, begin applications prior to disease development at the onset of disease symptoms. Applications should be made prior to head emergence. Use the higher rate and shorter interval when disease pressure is high. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                          |
| <b>FUSARIUM HEAD BLIGHT (<i>Fusarium graminearum</i>)</b>                                                                                                                                                                         |                               |             |                                     |                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| For more information, see Table 4–18. <i>Chemical Control Options for Foliar, Stem and Head Diseases in Wheat — Fusarium Head Blight</i> , on page 87, as well as OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> . | metconazole                   | Caramba     | 1 L/ha<br>(0.4 L/acre)              | 30                                     | <b>Provides suppression only.</b> Ground and aerial application. Timing of application is critical. Apply at 20% flowering (Zadok's 61–63) using sprayer nozzles configured to provide excellent coverage of the cereal head. Use a minimum of 100 L/ha of water for ground application, 50 L/ha of water for aerial application. Maximum 1 application/yr. 5-day re-entry period.                                                                                                    |
|                                                                                                                                                                                                                                   | picoxystrobin                 | Acapela     | 0.44–0.88 L/ha<br>(178–356 mL/acre) | Do not apply at boot stage and beyond. | Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Use high rate and shorter interval when disease pressure is high. Optimum protection of flag leaf is provided when applied at “flag leaf out” (Zadok's 39). Do not apply at boot stage (Zadok's 47) and beyond. Apply no more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 2.64 L/ha/season. 12-hr re-entry period. |

## CEREAL GROWTH REGULATORS

**Table 4-46.** Growth Regulators for Lodging Reduction In Cereals

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                                               | Active Ingredient | Trade Name | Rate                                                                                                                                                                                                                                                | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Visit the Ontario Cereal Crops Committee website at <a href="http://www.gocereals.ca">www.gocereals.ca</a> for performance trial information. High-risk factors for lodging include fields with a history of manure applications and legume hay. | ethephon          | Ethrel     | Spring barley:<br>1.0–1.5 L/ha<br>(0.4–0.6 L/acre)<br><i>2-row cultivar</i><br>1.0–2.0 L/ha<br>(0.4–0.8 L/acre)<br><i>6-row cultivar</i><br>Spring wheat:<br>1.0–1.5 L/ha<br>(0.4–0.6 L/acre)<br>Winter wheat:<br>1.25–2.5 L/ha<br>(0.5–1.0 L/acre) | 35  | Ground and aerial application. Timing of application is critical. Use lower rate unless expecting severe lodging conditions. Apply when most of the tillers are between early flag leaf emergence to swollen boot stage (Zadok's 37–45). Do not apply after more than 10% of the awns have emerged (Zadok's 49). Use higher rates on crops that are heavily fertilized (more than 100 kg/ha of total available nitrogen) and have ample moisture (more than 25 cm of precipitation) and are prone to lodging. |



## 5. Dry Edible Beans

### DRY EDIBLE BEAN INSECTS

**Table 5–1.** Chemical Control Options for Insects in Dry Edible Beans — Seedcorn Maggot, Wireworms

| Integrated Pest Management Options                                                                                                                                                                                                                                                                            | Active Ingredient                              | Trade Name         | Rate                                                  | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|--------------------|-------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SEEDCORN MAGGOT (<i>Delia platura</i>)</b>                                                                                                                                                                                                                                                                 |                                                |                    |                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                         |                                                |                    |                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Seedcorn maggot problems in dry beans are rare in Ontario. Risk factors include cool, wet springs when germination is delayed. In fields at high risk, including early-planted fields where large amounts of manure, green manure or residue have recently been incorporated, use insecticide seed treatment. | thiamethoxam                                   | Cruiser 5FS        | 50–83 mL/<br>100 kg seed                              | <b>For use in commercial seed treatment facilities only.</b> Use higher rate when expecting high insect populations. May be mixed with Apron Maxx RTA for control of seed and soil-borne pathogens. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                                                                                                                                                                                                                                                                                               | thiamethoxam<br>+ metalaxyl-M<br>+ fludioxonil | Cruiser Maxx Beans | 195 mL/<br>100 kg seed                                | <b>For use in commercial seed treatment facilities only.</b> Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers for details prior to use. For anthracnose control, tank-mix with 10 mL of Dynasty 100FS/100 kg seed. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>WIREWORMS (<i>Limonius</i> spp. and others)</b>                                                                                                                                                                                                                                                            |                                                |                    |                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                         |                                                |                    |                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , for sampling methods.                                                                                                                                                                                                                     | imidicloprid                                   | Stress Shield 600  | 104 mL/<br>100 kg seed<br>(62.5 g ai/<br>100 kg seed) | <b>For use in commercial seed treatment facilities only.</b> For control of certain seed and soil-borne pathogens in legume seeds and seedlings, mix Stress Shield 600 with the following seed treatment fungicides: Trilex AL, Trilex AL Concentrate, Trilex FS, Allegiance, EverGol Energy, Apron Max RFC and Apron Max RTA. Follow all appropriate directions and precautions as specified on the fungicide labels. Make sure that specific legume crop to be treated is registered on the fungicide partner as well.<br><br>Use high rate for early seeding, when insect populations are expected to be high or extended control period for aphids is needed. This product contains no colourant. Seed treated with this product must be conspicuously coloured. Do not graze or feed livestock on treated areas for 4 weeks after planting.<br><br>Do not apply any subsequent application of a Group 4 insecticide (e.g., in-furrow or foliar application) following treatment with Stress Shield 600. |
|                                                                                                                                                                                                                                                                                                               | thiamethoxam<br>+ metalaxyl-M<br>+ fludioxonil | Cruiser Maxx Beans | 195 mL/<br>100 kg seed                                | <b>For use in commercial seed treatment facilities only.</b> Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers for details prior to use. For anthracnose control, tank-mix with 10 mL of Dynasty 100FS/100 kg seed. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

## DRY EDIBLE BEAN INSECTS

**Table 5–2.** Chemical Control Options for Insects in Dry Edible Beans — Mexican Bean Beetle

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                   | Active Ingredient | Trade Name   | Rate                              | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|--------------|-----------------------------------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>MEXICAN BEAN BEETLE (<i>Epilachna varivestis</i>)</b>                                                                                                                                                                                                                                                                                                                                                                             |                   |              |                                   |     |                                                                                                                                                                                                                                                                                                                      |
| <b>Foliar Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                              |                   |              |                                   |     |                                                                                                                                                                                                                                                                                                                      |
| Mexican bean beetles are less of a problem in very hot, dry summers. Early-maturing bean varieties may be grown with little or no injury. Several natural enemies help keep populations below action thresholds. Insecticides are only recommended if populations are extremely high, as they will also kill the natural enemy population. See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , for more information. | dimethoate        | Cygon 4 E    | 0.7–1.0 L/ha<br>(280–400 mL/acre) | 7   | Do not feed treated threshings or crop refuse to livestock.<br><br>This product is toxic to bees. Restrict application to the period after dark when bees are inside the hives, or in the early morning before the bees are foraging in the fields. <b>DO NOT</b> apply to such crops as alfalfa when in full bloom. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                      |                   | Lagon 480 EC |                                   |     |                                                                                                                                                                                                                                                                                                                      |

## DRY EDIBLE BEAN INSECTS

**Table 5–3.** Chemical Control Options for Insects in Dry Edible Beans — Potato Leafhopper

| <b>LEGEND:</b> PHI = Pre-Harvest Interval (in days)                                                                                                                                                                                                                                            |                                                | N/A = not applicable |                                                       |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|----------------------|-------------------------------------------------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Integrated Pest Management Options                                                                                                                                                                                                                                                             | Active Ingredient                              | Trade Name           | Rate                                                  | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>POTATO LEAFHOPPER (<i>Empoasca fabae</i>)</b>                                                                                                                                                                                                                                               |                                                |                      |                                                       |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Seed Treatments</b>                                                                                                                                                                                                                                                                         |                                                |                      |                                                       |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Consider using insecticide seed treatment on fields with a history of leafhopper infestations, to reduce the number of foliar applications required. Insecticide seed treatments last at least 4–6 weeks after planting, eliminating the need for at least one foliar insecticide application. | thiamethoxam                                   | Cruiser 5FS          | 86–143 mL/<br>100 kg seed                             | N/A | <b>For use in commercial seed treatment facilities only.</b> Use higher rate when expecting high insect populations. May be mixed with Apron Maxx RTA for control of seed and soil-borne pathogens. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                                                                                                                                                                                                                                                                                | thiamethoxam<br>+ metalaxyl-M<br>+ fludioxonil | Cruiser Maxx Beans   | 195 mL/<br>100 kg seed                                | N/A | <b>For use in commercial seed treatment facilities only.</b> Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers for details prior to use. For anthracnose control, tank-mix with 10 mL of Dynasty 100FS/100 kg seed. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                                                                                                                                                                                                                                                                                                | imidacloprid                                   | Stress Shield 600    | 104 mL/<br>100 kg seed<br>(62.5 g ai/<br>100 kg seed) | N/A | <b>For use in commercial seed treatment facilities only.</b> For control of certain seed and soil-borne pathogens in legume seeds and seedlings, mix Stress Shield 600 with the following seed treatment fungicides: Trilex AL, Trilex AL Concentrate, Trilex FS, Allegiance, EverGol Energy, Apron Max RFC and Apron Max RTA. Follow all appropriate directions and precautions as specified on the fungicide labels. Make sure that specific legume crop to be treated is registered on the fungicide partner as well.<br><br>Use high rate for early seeding, when insect populations are expected to be high or extended control period for aphids is needed. This product contains no colourant. Seed treated with this product must be conspicuously coloured. Do not graze or feed livestock on treated areas for 4 weeks after planting.<br><br>Do not apply any subsequent application of a Group 4 insecticide (e.g., in-furrow or foliar application) following treatment with Stress Shield 600. |

## DRY EDIBLE BEAN INSECTS

**Table 5–3.** Chemical Control Options for Insects in Dry Edible Beans — Potato Leafhopper

| LEGEND: PHI = Pre-Harvest Interval (in days)                                                                                                                                                                        |                    | N/A = not applicable               |                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------------------------------|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Integrated Pest Management Options                                                                                                                                                                                  | Active Ingredient  | Trade Name                         | Rate                              | PHI                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |
| POTATO LEAFHOPPER ( <i>Empoasca fabae</i> ) (cont'd)                                                                                                                                                                |                    |                                    |                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |
| Foliar Treatment                                                                                                                                                                                                    |                    |                                    |                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |
| Some tolerant varieties are available ( <a href="http://www.gobeans.ca">www.gobeans.ca</a> ). See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , for action threshold charts and sampling methods. | dimethoate         | Cygon 480 EC                       | 0.7–1.0 L/ha<br>(280–400 mL/acre) | 7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Some residual activity is expected from this product. Ground or aerial application. Do not feed treated threshings or crop refuse to livestock. Maximum 3 applications/yr.<br><br>This product is toxic to bees. Restrict application to the period after dark when bees are inside the hives, or in the early morning before the bees are foraging in the fields. <b>DO NOT</b> apply to such crops as alfalfa when in full bloom.                                                                                                                                                                                                                                                               |  |
|                                                                                                                                                                                                                     |                    | Lagon 480 EC                       |                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |
|                                                                                                                                                                                                                     | lambda-cyhalothrin | Matador 120 E                      | 83 mL/ha<br>(34 mL/acre)          | 14                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | This product has no systemic activity. Ground and aerial application. For best results, apply during the early morning, before temperatures rise, and during the evening. Use 100–200 L of water/ha for ground application. Use 20 L of water/ha for aerial applications. Do not graze or feed on treated forage. Maximum 3 applications/yr. 24-hr re-entry period.<br><br>This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. |  |
|                                                                                                                                                                                                                     |                    | Silencer 120 EC                    | 83 mL/ha<br>(34 mL/acre)          | 14                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | This product has no systemic activity. <b>Ground application only.</b> For best results, apply during the early morning, before temperatures rise, and during the evening. Do not graze or harvest treated forage, straw or hay for livestock feed. Maximum 3 applications/yr. 24-hr re-entry period.<br><br>This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.                                                               |  |
| flupyradifurone                                                                                                                                                                                                     | Sivanto Prime      | 500–750 mL/ha<br>(202–303 mL/acre) | 7                                 | The maximum amount of Sivanto Prime allowed per crop season is 2,000 mL/ha. Apply as a foliar application ensuring thorough coverage. Do not make any application of Sivanto Prime following soil, in-furrow or seed treatment applications of a Group 4D insecticide.<br><br>Toxic to adult bees in laboratory studies via oral exposure, however, not toxic to bees through contact exposure, and field studies conducted with this product have shown no effects on honeybee colony development. Minimize spray drift to reduce exposure to bees in habitats close to the application site. Application during the crop blooming period, and when flowering weeds are present, may only be made in the early morning and the evening when most bees are not foraging. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |

## DRY EDIBLE BEAN INSECTS

**Table 5–4.** Chemical Control Options for Insects in Dry Edible Beans — Bean Leaf Beetle

| <b>LEGEND:</b> PHI = Pre-Harvest Interval (in days)                                                                                                                                                                                                                                                                                                                     |                                                | N/A = not applicable             |                                                                                   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|----------------------------------|-----------------------------------------------------------------------------------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                      | Active Ingredient                              | Trade Name                       | Rate                                                                              | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>BEAN LEAF BEETLE (<i>Certoma trifurcata</i>)</b>                                                                                                                                                                                                                                                                                                                     |                                                |                                  |                                                                                   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Seed Treatments</b>                                                                                                                                                                                                                                                                                                                                                  |                                                |                                  |                                                                                   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Use in fields with a history of early season infestations. If defoliation after seedling is a concern, a well timed foliar will provide control.                                                                                                                                                                                                                        | thiamethoxam<br>+ metalaxyl-M<br>+ fludioxonil | Cruiser Maxx Beans               | 195 mL/<br>100 kg seed                                                            | N/A | <b>For use in commercial seed treatment facilities only.</b> Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers for details prior to use. For anthracnose control, tank-mix with 10 mL of Dynasty 100FS/100 kg seed. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Foliar Treatment</b>                                                                                                                                                                                                                                                                                                                                                 |                                                |                                  |                                                                                   |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Use defoliation thresholds for dry beans found in OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> . During pod stages, with higher value and stringent quality standards in dry beans, if 5%–8% of the pods inspected have feeding scars, control may be necessary. Ensure that adults are still presently active in the field before a spray is applied. | lambda-cyhalothrin                             | Matador 120 E<br>Silencer 120 EC | ground:<br>83–233 mL/ha<br>(34–94 mL/acre)<br>aerial:<br>83 mL/ha<br>(34 mL/acre) | 14  | Use the higher rate to target higher pest populations or conditions conducive to bean pod mottle virus. Ground and aerial application. For best results, apply during the early morning, before temperatures rise, and during the evening. Use 100–200 L of water/ha for ground application. Use 20 L of water/ha for aerial applications. Do not graze or feed on treated forage. Maximum 3 applications/yr. 24-hr re-entry period.<br><br>This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                         | lambda-cyhalothrin<br>+<br>chlorantraniliprole | Voliam Xpress                    | 500 mL/ha<br>(202 mL/ha)                                                          | 14  | Apply no later than when the first feeding is seen on foliage. Maximum of 3 applications/yr by ground, 1 application/yr by air. Apply in a minimum of 100–200 L of water/ha for ground applications, 40 L of water/ha for aerial applications.<br><br>This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.                                                                                                                                                                                                                                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                         | thiamethoxam<br>+<br>lambda-cyhalothrin        | Endigo                           | 180 mL/ha<br>(73 mL/acre)                                                         | 21  | Base the need and timing of application on the presence of vulnerable pest developmental stages and significant populations as determined by local monitoring. Allow at least 7 days between treatments. Do not graze or harvest treated forage, straw or hay for livestock feed. Do not apply this product within 45 days of planting if seeds were treated with a neonicotinoid product. Do not exceed a total of 540 mL/ha of Endigo per season. Maximum of 3 applications/yr. Use a minimum of 100–200 L of water/ha for ground application and 20 L of water/ha for aerial applications.<br><br>Toxic to bees. To minimize exposure to bees from foliar application, <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. |
|                                                                                                                                                                                                                                                                                                                                                                         | dimethoate                                     | Cygon 480 EC<br>Lagon 480 EC     | 0.7–1.0 L/ha<br>(280–400 mL/acre)                                                 | 7   | Some residual activity is expected from this product. Ground or aerial application. Do not feed treated threshings or crop refuse to livestock. Maximum 3 applications/yr.<br><br>This product is toxic to bees. Restrict application to the period after dark when bees are inside the hives, or in the early morning before the bees are foraging in the fields. <b>DO NOT</b> apply to such crops as alfalfa when in full bloom.                                                                                                                                                                                                                                                                                                                                                                                                                                               |

## DRY EDIBLE BEAN INSECTS

**Table 5–5.** Chemical Control Options for Insects in Dry Edible Beans — Western Bean Cutworm, Tarnished Plant Bug

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Active Ingredient                        | Trade Name      | Rate                                | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-----------------|-------------------------------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>WESTERN BEAN CUTWORM (<i>Striacosta albicosta</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                          |                 |                                     |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Foliar Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                          |                 |                                     |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <p>Larvae mine into the pod, feeding directly on the seed. Their entry holes also allow for the introduction of pod diseases. All these activities have a negative impact on yield, seed quality and increase pick. It is difficult to scout for WBC eggs or larvae in dry beans. Use pheromone traps instead to monitor for presence and peak flight. If pod feeding is easily found, spray is necessary. Apply insecticide 10–20 days after peak moth flight when larval feeding is expected.</p> <p>Additional information on pest status and management recommendations are provided at the Ontario WBC Trap Network: <a href="http://www.cornpest.ca">www.cornpest.ca</a>.</p> | lambda-cyhalothrin                       | Matador 120 EC  | 83–187 mL/ha<br>(34–76 mL/acre)     | 21  | <p>Ground or aerial application. For best results, apply in the early morning, before temperatures rise, or during the evening. Use 100–200 L water/ha for ground application, 20 L water/ha for aerial application. Spray no later than 10 days after egg hatch. Maximum 3 applications/yr. Do not make more than 2 applications of 83 mL/ha by air. 24-hr re-entry period.</p> <p>This product is toxic to bees when exposed to direct treatment, drift, or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.</p>                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                          | Silencer 120 EC | 83–187 mL/ha<br>(33.6–75.7 mL/acre) | 21  | <p>Cutworm activity is greatest during the late evening and night. Time application as close as possible to insect-feeding activity. For western bean cutworm control, repeat sprays at 4–7-day intervals. Use 100–200 L water/ha for ground application, 20 L water/ha for aerial application. Spray no later than 10 days after egg hatch. Maximum 3 applications/yr. Do not make more than 2 applications of 83 mL/ha by air. 24-hr re-entry period.</p> <p>This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.</p> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | chlorantraniliprole                      | Coragen         | 250–375 mL/ha<br>(101–151 mL/acre)  | 1   | <p>For ground application, use a minimum water volume of 100 L/ha and 50 L/ha for aerial. Use high rate of Coragen under heavy pest pressure. Apply when rain is not expected in the next 24 hr. Apply when plants are small, so that lower portions of plant can receive adequate coverage. Minimum of 3 days between applications. Maximum 4 applications/yr. Do not exceed a total of 1.125 L of Coragen/ha/season. 12-hr re-entry period.</p>                                                                                                                                                                                                                                                                                                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | lambda-cyhalothrin + chlorantraniliprole | Voliam Xpress   | 500 mL/ha<br>(202 mL/ha)            | 14  | <p>Apply no later than when the first feeding is seen on foliage. Maximum of 3 applications/yr by ground, 1 application/yr by air. Apply in a minimum of 100–200 L of water/ha for ground applications, 40 L of water/ha for aerial applications.</p> <p>This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.</p>                                                                                                                                                                                                       |

## DRY EDIBLE BEAN INSECTS

**Table 5–5.** Chemical Control Options for Insects in Dry Edible Beans — Western Bean Cutworm, Tarnished Plant Bug

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                        | Active Ingredient  | Trade Name      | Rate                            | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|-----------------|---------------------------------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>TARNISHED PLANT BUG (<i>Lygus lineolaris</i>) and <i>LYGUS</i> spp.</b>                                                                                                                                                |                    |                 |                                 |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Foliar Treatment</b>                                                                                                                                                                                                   |                    |                 |                                 |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <p><i>Lygus</i> spp. can sting the developing pods, resulting in damaged seeds. Monitor beans during the early pod-filling stages. A treatment may be required when there are 1–2 bugs per sweep later in the season.</p> | dimethoate         | Cygon 4 E       | 0.7–1 L/ha<br>(280–400 mL/acre) | 7   | <p>Some residual activity is expected from this product. Ground or aerial application. Do not feed treated threshings or crop refuse to livestock. Maximum 3 applications/yr.</p> <p>This product is toxic to bees. Restrict application to the period after dark when bees are inside the hives, or in the early morning before the bees are foraging in the fields. <b>DO NOT</b> apply to such crops as alfalfa when in full bloom.</p>                                                                                                                                                                                                                                                               |
|                                                                                                                                                                                                                           |                    | Lagon 480 E     |                                 |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                                                                                                                                                                                                           | lambda-cyhalothrin | Matador 120 E   | 83 mL/ha<br>(34 mL/acre)        | 21  | <p>This product has no systemic activity. Ground and aerial application. For best results, apply during the early morning, before temperatures rise, and during the evening. Use 100–200 L of water/ha for ground application. Use 20 L of water/ha for aerial applications. Do not graze or feed on treated forage. Maximum 3 applications/yr. 24-hr re-entry period.</p> <p>This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.</p> |
|                                                                                                                                                                                                                           |                    | Silencer 120 EC | 83 mL/ha<br>(34 mL/acre)        | 14  | <p>This product has no systemic activity. <b>Ground application only.</b> For best results, apply during the early morning, before temperatures rise, and during the evening. Do not graze or harvest treated forage, straw or hay for livestock feed. Maximum 3 applications/yr. 24-hr re-entry period.</p> <p>This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.</p>                                                               |

## DRY EDIBLE BEAN DISEASES

**Table 5–6.** Chemical Control Options for Seed and Seedling Diseases in Dry Edible Beans — Seedling Diseases, Pythium Damping-Off

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                             | Active Ingredient                            | Trade Name | Rate                          | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SEED and SEEDLING DISEASES</b>                                                                                                                                                                                                                                                                                                                                                                                                                              |                                              |            |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>SEEDLING DISEASES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                              |            |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                              |            |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Seedling diseases are present in all fields and all soil types. Maintain or build up good soil tilth by following a good crop rotation (3 yr between bean crops of any kind). Do not overwork the soil and avoid working it when it is wet. Apply seed treatments that will help protect the plant from root rots during germination and early growth. Use tolerant varieties. Consult your seed company and the Ontario Pulse Crops Committee Variety Trials. | diazinon<br>+ captan<br>+ thiophanate-methyl | DCT        | 1 L of slurry/<br>100 kg seed | Due to the threat of anthracnose infection to this crop, ALL edible bean seed should be treated with DCT or Dynasty 100FS. Seedling blights and damping-off are also controlled. Use full rate and ensure good coverage by applying as a slurry. Available as a 400-g container that will treat 77 kg of dry bean seed. To make a slurry, use 520 g seed treatment/L of water. For control of pythium and phytophthora root rots, add metalaxyl. |

## DRY EDIBLE BEAN DISEASES

**Table 5–6.** Chemical Control Options for Seed and Seedling Diseases in Dry Edible Beans — Seedling Diseases, Pythium Damping-Off

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Active Ingredient                              | Trade Name                | Rate                                           | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|---------------------------|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>PYTHIUM DAMPING-OFF (<i>Pythium</i> spp.)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                |                           |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                |                           |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <p>This disease can occur on all soil types but losses are greatest on wet, clay soils. Minimize soil compaction and remove excess moisture through increased drainage. Treat seed with metalaxyl or metalaxyl-M and plant into warm soils (16°C). Rotate 3–4 yr between bean crops.</p> <p>Due to the threat of anthracnose infection to this crop, ALL edible bean seed should be treated with DCT or Dynasty 100FS. See Table 5–8. Chemical Control Options for Seed and Seedling Diseases in Dry Edible Beans — Anthracnose, <i>Phytophthora</i> spp., on page 135, for more details.</p> | metalaxyl-M                                    | Apron XL LS               | 20–40 mL/<br>100 kg seed                       | <b>For use in commercial seed treatment facilities only.</b> Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at or immediately before planting. Do not graze or feed livestock on seeded area for 4 weeks after planting. Read label for information regarding resistant strains of fungus.                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | metalaxyl                                      | Allegiance FL<br>Apron FL | 46–110 mL/<br>100 kg seed                      | Do not graze or feed livestock on seeded area for 4 weeks after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | fludioxonil<br>+ metalaxyl-M                   | Apron Maxx<br>RTA         | 325 mL/<br>100 kg seed                         | For both commercial seed treatment plants and on-farm treatment using standard gravity- or mist-type seed treatment equipment. Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers prior to use. Ensure uniform coverage.                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                | Apron Maxx<br>RFC         | 100 mL<br>+ 230 mL of<br>water/<br>100 kg seed | For commercial and on-farm treating. Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting. For anthracnose control, tank-mix with DCT or 10 mL of Dynasty 100FS/100 kg seed.                                                                                                                                                                                                                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | thiamethoxam<br>+ metalaxyl-M<br>+ fludioxonil | Cruiser Maxx<br>Beans     | 195 mL/<br>100 kg seed                         | <b>For use in commercial seed treatment facilities only.</b> Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting. For anthracnose control, tank-mix with 10 mL of Dynasty 100FS/100 kg of seed.                                                                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | penflufen<br>+ prothioconazole<br>+ metalaxyl  | EverGol<br>Energy         | 65 mL/<br>100 kg seed                          | For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.                                                                                                                                                                                                                                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ethaboxam                                      | Intego Solo<br>Fungicide  | 19.6 mL/<br>100 kg seed                        | For commercial and on-farm treating. Regulations under the <i>Seeds Act</i> require that an appropriate colourant be added when this product is applied to seed.<br><br>For best results, use Intego Solo Fungicide combined with other oomycete-active seed treatment fungicides, such as metalaxyl, to broaden the spectrum of activity. Intego Solo Fungicide can also be used in combination with a broad-spectrum registered seed treatment fungicide having activity against <i>Rhizoctonia solani</i> and other fungal pathogens inciting seed and seedling disease. |

## DRY EDIBLE BEAN DISEASES

**Table 5–7.** Chemical Control Options for Seed and Seedling Diseases in Dry Edible Beans — *Fusarium* Seed and Root Rot

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Active Ingredient                              | Trade Name            | Rate                                           | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|-----------------------|------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SEED and SEEDLING DISEASES</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                |                       |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>FUSARIUM SEED and ROOT ROT (<i>Fusarium solani</i> f. sp. <i>phaseoli</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                |                       |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                |                       |                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <p><i>Fusarium</i> begins as small, reddish-brown lesions on the taproot that join to form larger lesions, or streaks, as the plant ages. The lesion can extend up to the soil line. The splitting of the tap root, crown and lower stem often reveals a brown-reddish internal discolouration of the water-conducting tissue.</p> <p>Longitudinal cracks and adventitious roots may develop on damaged plants. These adventitious roots are formed above the damaged area. Late infection seldom results in dead plants but rather in stunted, unthrifty-looking ones. Disease development is promoted by soil compaction, short crop rotations and moisture stress.</p> <p>Due to the threat of anthracnose infection to this crop, ALL edible bean seed should be treated with DCT or Dynasty 100FS. See <i>Table 5–8 Chemical Control Options for Seed and Seedling Diseases in Dry Edible Beans — Anthracnose, Phytophthora spp.</i>, on page 135, for more details. Other seed treatment products may be needed to protect against other edible bean diseases.</p> | diazinon<br>+ captan<br>+ thiophanate-methyl   | DCT                   | 1 L of slurry/<br>100 kg seed                  | Due to the threat of anthracnose infection to this crop, ALL edible bean seed should be treated with DCT or Dynasty 100FS. Seedling blights and damping-off are also controlled. Use full rate and ensure good coverage by applying as a slurry. Available in a 400-g container that will treat 77 kg of dry bean seed. To make a slurry, use 520 g seed treatment/L of water. For control of pythium and phytophthora root rots, add metalaxyl. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | carbathiin<br>+ thiram                         | Vitaflo 280           | 260 mL/<br>100 kg seed                         | <b>For use in commercial seed treatment facilities only.</b> Ensure good seed coverage. This product will not control anthracnose if seed is severely infected.                                                                                                                                                                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | fludioxonil<br>+ metalaxyl-M                   | Apron Maxx<br>RTA     | 325 mL/<br>100 kg seed                         | For both commercial seed treatment plants and on-farm treatment using standard gravity- or mist-type seed treatment equipment. Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers prior to use. Ensure uniform coverage.                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                | Apron Maxx<br>RFC     | 100 mL<br>+ 230 mL of<br>water/<br>100 kg seed | For commercial and on-farm treating. Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting. For anthracnose control, tank-mix with DCT or 10 mL of Dynasty 100FS/100 kg seed.                                                                                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | thiamethoxam<br>+ metalaxyl-M<br>+ fludioxonil | Cruiser Maxx<br>Beans | 195 mL/<br>100 kg seed                         | <b>For use in commercial seed treatment facilities only.</b> Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting. For anthracnose control, tank-mix with 10 mL of Dynasty 100FS/100 kg of seed.                                                                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | trifloxystrobin                                | Trilex FS             | 21 mL/<br>100 kg seed                          | <b>For use in commercial seed treatment facilities only.</b> Apply using standard commercial seed treatment equipment. Not for use in hopper-box, planter-box, slurry-box or similar seed treatment applications. Uniform application on seed is necessary to ensure seed safety and best disease protection.                                                                                                                                    |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | penflufen<br>+ prothioconazole<br>+ metalaxyl  | EverGol<br>Energy     | 65 mL/<br>100 kg seed                          | For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.                                                                                                                                               |

## DRY EDIBLE BEAN DISEASES

**Table 5–8.** Chemical Control Options for Seed and Seedling Diseases in Dry Edible Beans — Anthracnose, *Phytophthora* spp.

| LEGEND: PHI = Pre-Harvest Interval (in days) N/A = not applicable                                                                                                                                                                                                                                                                                                  |                                              |                       |                                    |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|-----------------------|------------------------------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                 | Active Ingredient                            | Trade Name            | Rate                               | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |
| ANTHRACNOSE ( <i>Colletotrichum lindemuthianum</i> )                                                                                                                                                                                                                                                                                                               |                                              |                       |                                    |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |
| Seed Treatment                                                                                                                                                                                                                                                                                                                                                     |                                              |                       |                                    |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |
| Anthracnose is best controlled by planting disease-free seed and using a seed treatment containing DCT or Dynasty 100FS. Should disease still appear, use a foliar fungicide as a rescue treatment.                                                                                                                                                                | diazinon<br>+ captan<br>+ thiophanate-methyl | DCT                   | 1 L of slurry/<br>100 kg seed      | N/A | Due to the threat of anthracnose infection to this crop, ALL edible bean seed should be treated with DCT or Dynasty 100FS. Available in a 400-g container that will treat 77 kg of dry bean seed. To make slurry, use 520 g seed treatment/L of water. Use full rate and ensure good coverage by applying as a slurry. For control of pythium and phytophthora root rots, add metalaxyl.                                                                                                                                                                                      |  |
|                                                                                                                                                                                                                                                                                                                                                                    | azoxystrobin                                 | Dynasty<br>100FS      | 10 mL/<br>100 kg seed              | N/A | Due to the threat of anthracnose infection to this crop, ALL edible bean seed should be treated with DCT or Dynasty 100FS. For additional disease control, use in combination with Apron Maxx RFC or Cruiser Maxx Beans.                                                                                                                                                                                                                                                                                                                                                      |  |
| Foliar Treatment                                                                                                                                                                                                                                                                                                                                                   |                                              |                       |                                    |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |
| Rainy weather favours this disease, as spores are splashed from diseased areas and carried in wind-borne water droplets or by surface water throughout the field. Take note of weather forecasts, as wet conditions over a prolonged period of time can result in epidemics. Timing of foliar fungicides is important. Apply treatment when disease first appears. | azoxystrobin                                 | Quadris               | 500 mL/ha<br>(200 mL/acre)         | 15  | Ground and aerial application. Apply 1st application at early flower or when disease first appears. If necessary, re-apply 10–14 days later if disease persists. Maximum 2 applications/yr.                                                                                                                                                                                                                                                                                                                                                                                   |  |
|                                                                                                                                                                                                                                                                                                                                                                    | pyraclostrobin                               | Headline<br>EC        | 400 mL/ha<br>(160 mL/acre)         | 30  | Ground and aerial application. Apply when disease first appears. If necessary, re-apply 10–14 days later if disease persists. This product should not be tank-mixed with Lance, as precipitates can develop. To minimize risk of precipitates forming, use water >10°C and spray solution promptly. Maximum 2 applications/season.                                                                                                                                                                                                                                            |  |
|                                                                                                                                                                                                                                                                                                                                                                    | fluopyram<br>+ prothioconazole               | Propulse              | 500–700 mL/ha<br>(202–303 mL/acre) | 14  | <b>Ground application only.</b> Begin application preventively. When disease pressure is high, or when agronomic or weather conditions are conducive to disease development, continue applications as needed on a 7–14-day interval. Use shorter intervals in this range for best protection. When conditions for heavy infestation exist or when growing a less resistant cultivar, use the higher rate. Ensure good canopy penetration for optimum results. Do not exceed 1.5 L/ha/season (2 applications). Do not graze treated area and do not harvest for forage or hay. |  |
|                                                                                                                                                                                                                                                                                                                                                                    | pyraclostrobin<br>+ fluxapyroxad             | Priaxor               | 0.3 L/ha<br>(120 mL/acre)          | 30  | Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                 |  |
| PHYTOPHTHORA spp. — Suppression only                                                                                                                                                                                                                                                                                                                               |                                              |                       |                                    |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |
| Seed Treatment                                                                                                                                                                                                                                                                                                                                                     |                                              |                       |                                    |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |
| See Table 2–7. Chemical Control Options for Diseases in Soybeans — Soybean Cyst Nematode, Phytophthora Root Rot, on page 40.                                                                                                                                                                                                                                       | ethaboxam                                    | Intego Solo Fungicide | 19.6 mL/<br>100 kg seed            | N/A | For commercial and on-farm treating. Regulations under the Seeds Act require that an appropriate colourant be added when this product is applied to seed.<br><br>For best results, use Intego Solo Fungicide combined with other oomycete-active seed treatment fungicides, such as metalaxyl, to broaden the spectrum of activity. Intego Solo Fungicide can also be used in combination with a broad-spectrum registered seed treatment fungicide having activity against <i>Rhizoctonia solani</i> and other fungal pathogens inciting seed and seedling disease.          |  |

## DRY EDIBLE BEAN DISEASES

**Table 5–9.** Chemical Control Options for Seed and Seedling Diseases in Dry Edible Beans — *Rhizoctonia*

| Integrate Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Active Ingredient                              | Trade Name            | Rate                                           | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                           |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|-----------------------|------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>RHIZOCTONIA (<i>Rhizoctonia solani</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                |                       |                                                |                                                                                                                                                                                                                                                                                                                                                |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                |                       |                                                |                                                                                                                                                                                                                                                                                                                                                |
| <p>This disease occurs when conditions are cool and wet during planting or when these conditions result in a delay in seedling emergence or development. Mid-to-late-season moisture stress (dry conditions) can increase the disease incidence. Management practices include: (1) selecting varieties with good general tolerance to root rots, (2) promoting root growth through a good fertility program, (3) rotating crop (3 yr between bean crops), (4) not overworking the soil and avoiding working it when it is wet, (5) removing excessive water through increased tile drainage and minimizing compaction and (6) applying seed treatments that protect the plant during germination and early growth. Consult your seed company for variety information.</p> <p>Due to the threat of anthracnose infection to this crop, ALL edible bean seed should be treated with DCT or Dynasty 100FS. See <i>Table 5–8 Chemical Control Options for Seed and Seedling Diseases in Dry Edible Beans — Anthracnose, <i>Phytophthora</i> spp.</i>, on page 135, for more details. Other seed treatment products may be needed to protect against other edible bean diseases.</p> | azoxystrobin                                   | Dynasty 100FS         | 10 mL/<br>100 kg seed                          | One application as a seed treatment. For additional disease control, use in combination with Apron Maxx RFC or Cruiser Maxx Beans.                                                                                                                                                                                                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | carbathiin<br>+ thiram                         | Vitaflo 280           | 260 mL/<br>100 kg seed                         | <b>For use in commercial seed treatment facilities only.</b> Ensure good seed coverage.                                                                                                                                                                                                                                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | fludioxonil<br>+ metalaxyl-M                   | Apron Maxx<br>RTA     | 325 mL/<br>100 kg seed                         | For both commercial seed treatment plants and on-farm treatment using standard gravity- or mist-type seed treatment equipment. Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers prior to use. Ensure uniform coverage.                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                | Apron Maxx<br>RFC     | 100 mL<br>+ 230 mL of<br>water/<br>100 kg seed | For commercial and on-farm treating. Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting.                                                                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | thiamethoxam<br>+ metalaxyl-M<br>+ fludioxonil | Cruiser Maxx<br>Beans | 195 mL/<br>100 kg seed                         | <b>For use in commercial seed treatment facilities only.</b> Compatible with <i>Rhizobium</i> -based inoculants. Check with inoculant manufacturers for details prior to use. Do not graze or feed livestock on treated areas for 45 days after planting. For anthracnose control, tank-mix with DCT or 10 mL of Dynasty 100FS/100 kg of seed. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | trifloxystrobin                                | Trilex FS             | 21 mL/<br>100 kg seed                          | <b>For use in commercial seed treatment facilities only.</b> Apply using standard commercial seed treatment equipment. Not for use in hopper-box, planter-box, slurry-box or similar seed treatment applications. Uniform application on seed is necessary to ensure seed safety and best disease protection.                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | penflufen<br>+ prothioconazole<br>+ metalaxyl  | EverGol Energy        | 65 mL/<br>100 kg seed                          | For commercial and on-farm treating. Uniform application is necessary for optimum product performance. This product contains no dye. An appropriate seed colourant must be applied. May be tank-mixed but see the label of the tank-mix partner for application rates, precautions and directions.                                             |

## DRY EDIBLE BEAN DISEASES

**Table 5–10.** Chemical Control Options for Foliar, Stem and Pod Diseases in Dry Edible Beans — Asian Soybean Rust

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                                                                   | Active Ingredient                | Trade Name  | Rate                               | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|-------------|------------------------------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>ASIAN SOYBEAN RUST (<i>Phakopsora pachyrhizi</i>)</b>                                                                                                                                                                                                             |                                  |             |                                    |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Foliar Treatment</b>                                                                                                                                                                                                                                              |                                  |             |                                    |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Edible beans are a host for Asian soybean rust. The extent to which these crops are impacted has yet to be determined. See Table 2–14. <i>Chemical Control Options for Diseases in Soybeans — Asian Soybean Rust</i> , on page 49, for more details on this disease. | pyraclostrobin                   | Headline EC | 400–600 mL/ha<br>(160–240 mL/acre) | 30  | Ground and aerial application. Classified as a strobilurin fungicide; use in a preventive fungicide program (pre-infection). See label for resistance management strategy. Maximum 2 applications/yr.                                                                                                                                                                                                                                                                                                                                                                         |
|                                                                                                                                                                                                                                                                      | azoxystrobin                     | Quadris     | 500 mL/ha<br>(200 mL/acre)         | 15  | Ground and aerial application. Apply 1st application at early flower or when disease first appears. If necessary, re-apply 10–14 days later if disease persists. Maximum 2 applications/yr.                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                      | propiconazole                    | Tilt 250 E  | 500–750 mL/ha<br>(200–300 mL/acre) | 30  | Ground and aerial application. Make first application at the first sign of disease followed by a second application 14 days after the first application, if environmental conditions continue to be favourable for disease development. See label for resistance management strategy. Maximum 2 applications/yr.                                                                                                                                                                                                                                                              |
|                                                                                                                                                                                                                                                                      | azoxystrobin<br>+ propiconazole  | Quilt       | 1.0–1.5 L/ha<br>(400–600 mL/acre)  | 30  | Ground and aerial application. Make the first application at the first sign of disease. Apply the high rate only under conditions of high disease pressures. A second application at a 14-day interval may be needed if disease persists. Good spray coverage and canopy penetration are important for best results. Apply in a minimum of 45 L of water/ha for ground application. See label for resistance management strategy. Maximum 2 applications/yr.                                                                                                                  |
|                                                                                                                                                                                                                                                                      | picoxystrobin                    | Acapela     | 0.6–0.88 L/ha<br>(240–350 mL/acre) | 14  | Ground and aerial application. Apply prior to disease development and continue on a 7–14-day interval. Use high rate and shorter interval when disease pressure is high. Apply no more than 1 application before switching to a fungicide with a different mode of action. Maximum 1.75 L/ha/season. 12-hr re-entry period.                                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                      | penthiopyrad                     | Vertisan    | 1–1.75 L/ha<br>(0.4–0.7 L/acre)    | 21  | Ground and aerial application. Begin applications prior to disease development and continue on a 7–14-day interval. Use higher rate and shorter interval when disease pressure is high. Do not apply more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 3 L/ha/yr. 12-hr re-entry period.                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                      | fluopyram<br>+ prothioconazole   | Propulse    | 500–700 mL/ha<br>(202–303 mL/acre) | 14  | <b>Ground application only.</b> Begin application preventively. When disease pressure is high, or when agronomic or weather conditions are conducive to disease development, continue applications as needed on a 7–14-day interval. Use shorter intervals in this range for best protection. When conditions for heavy infestation exist or when growing a less resistant cultivar, use the higher rate. Ensure good canopy penetration for optimum results. Do not exceed 1.5 L/ha/season (2 applications). Do not graze treated area and do not harvest for forage or hay. |
|                                                                                                                                                                                                                                                                      | pyraclostrobin<br>+ fluxapyroxad | Priaxor     | 0.3–0.45 L/ha<br>(120–160 mL/acre) | 30  | Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                 |

## DRY EDIBLE BEAN DISEASES

**Table 5–11.** Chemical Control Options for Foliar, Stem and Pod Diseases in Dry Edible Beans — Bean Rust

**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                      | Active Ingredient             | Trade Name    | Rate                                            | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                        |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|---------------|-------------------------------------------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>BEAN RUST (<i>Uromyces appendiculatus</i>)</b>                                                                                                                                                                                                                                                                                                                                       |                               |               |                                                 |     |                                                                                                                                                                                                                                                                                                             |
| <b>Foliar Treatment</b>                                                                                                                                                                                                                                                                                                                                                                 |                               |               |                                                 |     |                                                                                                                                                                                                                                                                                                             |
| <p>This disease is extremely rare in Ontario, arriving late in the season. Some dry bean market classes (e.g., pinto beans) can be very susceptible to rust. Consult your seed company for variety information or <a href="http://www.gobeans.ca">www.gobeans.ca</a> for more information.</p> <p>If rust arrives during flowering and early pod set, a treatment may be necessary.</p> | propiconazole                 | Tilt 250 E    | 500 mL/ha<br>(200 mL/acre)                      | 30  | Ground and aerial application. Apply when disease is first detected. Maximum 2 applications/yr.                                                                                                                                                                                                             |
|                                                                                                                                                                                                                                                                                                                                                                                         |                               | Bumper 418 EC | 300 mL/ha<br>(121 mL/acre)                      | 30  | Ground and aerial application. Apply when disease is first detected. Maximum 2 applications/yr.                                                                                                                                                                                                             |
|                                                                                                                                                                                                                                                                                                                                                                                         | pyraclostrobin                | Headline EC   | 400–600 mL/ha<br>(160–240 mL/acre)              | 30  | Ground and aerial application. Apply when disease first appears. If necessary, re-apply 10–14 days later if disease persists. Do not tank-mix with Lance as precipitates can develop. Maximum 2 applications/yr.                                                                                            |
|                                                                                                                                                                                                                                                                                                                                                                                         | pyraclostrobin + fluxapyroxad | Priaxor       | 0.3 L/ha<br>(120 mL/acre)                       | 30  | Ground and aerial application. For optimal disease control, begin applications prior to disease development. Use a minimum water volume of 100 L/ha for ground application. Maximum 2 applications/yr. 12-hr re-entry period.                                                                               |
|                                                                                                                                                                                                                                                                                                                                                                                         | copper octanoate              | Cueva         | 0.5%–2% solution,<br>applied at<br>470–940 L/ha | 1   | Ground application. For best control, begin treatment 2 weeks before disease normally appears or when weather forecasts predict a long period of wet weather. Alternatively, begin treatment when disease first appears and repeat at 5–10-day intervals. Maximum 15 applications/yr. 4-hr re-entry period. |

## DRY EDIBLE BEAN DISEASES

**Table 5–12.** Chemical Control Options for Foliar, Stem and Pod Diseases in Dry Edible Beans — White Mould

**LEGEND:** PHI = Pre-Harvest Interval (in days)

— = no information on label

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Active Ingredient            | Trade Name    | Rate                                | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|---------------|-------------------------------------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>WHITE MOULD (<i>Sclerotinia sclerotiorum</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                              |               |                                     |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Avoid soybeans, canola and other hosts in a 3-yr rotation, since these crops are susceptible to white mould. Rotate with non-host crops such as wheat, corn and barley. In fields with a history of the disease, select varieties with an upright structure. Lower plant populations and increased row width promote rapid drying of the plants and soil surface and therefore reduce potential for infection. Avoid excess fertilization. Those fields at risk have a past history of white mould and above-average foliage growth. All products must be used as a preventive measure, as they will not be effective once the disease is present. | boscalid                     | Lance         | 560–770 g/ha<br>(227–312 g/acre)    | 21  | Ground and aerial application. Best used as a preventive measure. Apply at 20%–50% flowering. Apply a second time 7–10 days later, up to 50% flowering, if disease persists or weather conditions are favourable for disease development. Do not tank-mix with Headline as precipitates can develop. Plant-back interval of 14 days for crops not on label. 4-hr re-entry period.                                                                                                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | fluazinam                    | Allegro 500F  | 0.6–1.0 L/ha<br>(243–400 mL/acre)   | 14  | Ground and aerial application. Best used as a preventive measure. Apply when plants are at early to mid-bloom (10%–30% bloom) and with repeat application, if necessary, 7–10 days later. Use sufficient water to ensure thorough coverage of foliage. Maximum 2 applications/yr and maximum of 2 L of product per season. 24-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | iprodione                    | Rovral WDG    | 1.0–1.5 kg/ha<br>(0.4–0.6 kg/acre)  | —   | Apply at 25%–75% bloom. Do not feed treated bean refuse to livestock. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | thiophanate-methyl           | Senator 70 WP | 1.75–2.25 kg/ha<br>(700–900 g/acre) | 14  | Apply when conditions favouring development of disease exist (warm, humid weather combined with heavy, dense crop foliage). Do not feed treated bean refuse to livestock.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | dicloran                     | Botran 75 WP  | 3.25 kg/ha<br>(1.3 kg/acre)         | 2   | Begin application when disease is anticipated, usually close to full bloom. Do not feed treated bean refuse to livestock.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <i>Coniothyrium minitans</i> | Contans WG    | 0.5–4 kg/ha<br>(0.20–1.6 kg/acre)   | 0   | <b>Provides suppression only.</b> Good option for organically grown beans. <b>Ground application only.</b> This product should be applied at least 3 months prior to anticipated outbreak (e.g., prior to planting). Product should be incorporated as thoroughly as possible to a depth of 5–20 cm. Rate should be increased to 2–4 kg/ha (0.8–1.6 kg/acre) if incorporated to a depth greater than 5 cm. A post-harvest application may be applied in the fall to treat the soil prior to spring planting of a susceptible crop. Treated soils in the fall should not be disturbed to avoid bringing untreated sclerotia from lower soil layers to the top soil layer. Maximum 2 applications/yr. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <i>Bacillus subtilis</i>     | Serenade ASO  | 4.0–15.0 L/ha<br>(1.6–6.0 L/acre)   | 0   | <b>Provides suppression only.</b> Good option for organically grown beans. Ground and aerial application. Under conditions of moderate-to-high disease pressure, use the higher rate and shorter application intervals. For maximum effectiveness, apply prior to, or at the early stages of disease development. Apply in sufficient water volume to ensure full coverage for effective control. Repeat as necessary on a 7–10-day interval.                                                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | fluopyram + prothioconazole  | Propulse      | 750 mL/ha<br>(303 mL/acre)          | 14  | <b>Ground application only.</b> Begin applications preventively. When disease pressure is high, or when agronomic or weather conditions are conducive to disease development, continue applications as needed on a 7–14-day interval. Use shorter intervals for best protection. Ensure good penetration for optimum results. Do not exceed 1.5 L/ha/season (2 applications). Do not graze treated area and do not harvest for forage or hay.                                                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | picoxystrobin                | Acapela       | 0.88 L/ha<br>(350 mL/acre)          | 14  | Ground and aerial application. Make preventive application at 100% bloom (1 flower blooming on all plants) and follow with second application 7–10 days later at full bloom. Apply no more than 1 application before switching to a fungicide with a different mode of action. Maximum 1.75 L/ha/season. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | metconazole                  | Quash         | 280 g/ha<br>(113.3 g/acre)          | 21  | Ground and aerial application. Apply prior to disease development. Make first application at 20%–50% bloom stage, before disease symptoms are visible. Make a second application at full bloom (minimum 7-day interval). Do not make more than 2 applications or apply more than 560 g/ha per season.                                                                                                                                                                                                                                                                                                                                                                                               |

## DRY EDIBLE BEAN DISEASES

**Table 5–13.** Chemical Control Options for Halo Blight, Common Blight, Brown Spot and Powdery Mildew

| <b>LEGEND:</b> PHI = Pre-Harvest Interval (in days)      — = no information on label                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                   |            |                                           |     |                                                                                                                                                                                                                                                                                                                            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------|-------------------------------------------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Active Ingredient | Trade Name | Rate                                      | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                       |
| <b>HALO BLIGHT (<i>Pseudomonas syringae</i> pv. <i>phaseolicola</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                   |            |                                           |     |                                                                                                                                                                                                                                                                                                                            |
| <b>Foliar Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                   |            |                                           |     |                                                                                                                                                                                                                                                                                                                            |
| Check with your seed supplier for dry bean varieties resistant to common bacterial blight or halo blight. The bacteria usually do not overwinter in the field. However, to be safe, allow 1 year between susceptible crops. Do not plant seed that has been harvested from infected fields or plant crop next to a field that had significant blight in the previous year. Incorporate infected bean debris into the soil after harvest. Bacterial blights spread easily when plants are wet from rain or dew. Stay out of wet fields with equipment and workers. Clean cultivators when moving from field to field. | copper octanoate  | Cueva      | 0.5%–2% solution, applied at 470–940 L/ha | 1   | <b>Ground application only.</b> For best control, begin treatment 2 weeks before disease normally appears or when weather forecasts predict a long period of wet weather. Alternatively, begin treatment when disease first appears and repeat at 5 to 10 day intervals. Maximum 15 applications/yr. 4-hr re-entry period. |
| <b>COMMON BLIGHT (<i>Xanthomonas campestris</i> pv. <i>phaseoli</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                   |            |                                           |     |                                                                                                                                                                                                                                                                                                                            |
| Check with your seed supplier for dry bean varieties resistant to common bacterial blight or halo blight. The bacteria usually do not overwinter in the field. However, to be safe, allow 1 year between susceptible crops. Do not plant seed that has been harvested from infected fields or plant crop next to a field that had significant blight in the previous year. Incorporate infected bean debris into the soil after harvest. Bacterial blights spread easily when plants are wet from rain or dew. Stay out of wet fields with equipment and workers. Clean cultivators when moving from field to field. | copper octanoate  | Cueva      | 0.5%–2% solution, applied at 470–940 L/ha | 1   | <b>Ground application only.</b> For best control, begin treatment 2 weeks before disease normally appears or when weather forecasts predict a long period of wet weather. Alternatively, begin treatment when disease first appears and repeat at 5 to 10 day intervals. Maximum 15 applications/yr. 4-hr re-entry period. |
| <b>BROWN SPOT (<i>Pseudomonas syringae</i> pv. <i>syringae</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                   |            |                                           |     |                                                                                                                                                                                                                                                                                                                            |
| This disease has been increasing, especially in specialty bean types.<br><br>Leaf lesions often don't appear water soaked and are much smaller than common bacterial blight and halo blight. When the disease becomes systemic, tan and sunken lesions with reddish-brown borders develop on stems and petioles. Pods may appear bent or have water-soaked lesions with a reddish-brown margin.                                                                                                                                                                                                                      | copper octanoate  | Cueva      | 0.5%–2% solution, applied at 470–940 L/ha | 1   | <b>Ground application only.</b> For best control, begin treatment 2 weeks before disease normally appears or when weather forecasts predict a long period of wet weather. Alternatively, begin treatment when disease first appears and repeat at 5 to 10 day intervals. Maximum 15 applications/yr. 4-hr re-entry period. |
| <b>POWDERY MILDEW (<i>Erysiphe</i> spp.)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                   |            |                                           |     |                                                                                                                                                                                                                                                                                                                            |
| See Table 2–13. Chemical Control Options for Diseases in Soybeans — Powdery Mildew, on page 48, for information.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | copper octanoate  | Cueva      | 0.5%–2% solution, applied at 470–940 L/ha | 1   | <b>Ground application only.</b> For best control, begin treatment 2 weeks before disease normally appears or when weather forecasts predict a long period of wet weather. Alternatively, begin treatment when disease first appears and repeat at 5–10-day intervals. Maximum 15 applications/yr. 4-hr re-entry period.    |

## 6. Canola and Mustard

### CANOLA AND MUSTARD INSECTS

**Table 6–1.** Chemical Control Options for Insects in Canola and Mustard — Flea Beetles, Diamondback Moth

| <b>LEGEND:</b> PHI = Pre-Harvest Interval (in days) — = no information on label N/A = not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                      |                                     |                              |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|-------------------------------------|------------------------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Integrated Pest Management Options</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Active Ingredient</b>                                             | <b>Trade Name</b>                   | <b>Rate</b>                  | <b>PHI</b> | <b>Comments (label precautions, re-entry periods, etc.)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>FLEA BEETLES (<i>Phyllotreta cruciferae</i> and <i>Phyllotreta striolata</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                      |                                     |                              |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                      |                                     |                              |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <p>Hot, dry weather favours this pest. Once the crop reaches the 3–4-leaf stage, the plants are generally established and can compensate for the feeding damage.</p> <p>Canola seedlings can withstand up to 25% defoliation in the cotyledon stage under good growing conditions without a significant reduction in yield. No thresholds are available for late-season pod feeding by the second generation of adults. Only when adult populations are extreme, and dry conditions are hindering the crop from compensating for the pod damage, is a spray recommended.</p> <p>Honeybees and other pollinators regularly visit canola and mustard flowers. Keep insecticide application to a minimum while the crop is in bloom to avoid bee-kills. Advise local beekeepers before you apply a pesticide, so that they may take precautions to protect their bees. For more information on preventing bee poisonings, see <i>Bee Poisoning</i>, on page 159.</p> | imidacloprid                                                         | Gaucha 480 FL                       | 820–1,640 mL/<br>100 kg seed | N/A        | <b>For use in commercial seed treatment facilities only.</b> Not for use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment application. Do not graze livestock on treated areas for 4 weeks after planting. Do not use mustard greens that have had Gaucha 480 FL seed treatment for human consumption. Use higher rate if flea beetle populations are high.                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | imidacloprid + carbathiin + thiram                                   | Gaucha CS FL                        | 1.4 L/<br>100 kg seed        | N/A        | <b>For use in commercial seed treatment facilities only.</b> Not for use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment application. Do not graze livestock on treated areas for 4 weeks after planting. Do not use mustard greens that have had Gaucha CS FL seed treatment for human consumption. Follow resistance management instructions as stated on label.                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | clothianidin + carbathiin + thiram + metalaxyl                       | Prosper FL                          | 1.25 L/<br>100 kg seed       | N/A        | <b>For use in commercial seed treatment facilities only.</b> Not for use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment application. 30-day plant-back on cereal grains, grasses, non-grass animal feeds, and soybean and dried beans is required. 1-yr plant-back interval is required for leafy, root and tuber vegetables. Can be tank-mixed with Poncho 600 FS for longer season control of flea beetles. Follow resistance management Instructions as stated on label. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | cyantraniliprole                                                     | Lumiderm                            | 960–1,600 mL/<br>100 kg seed | N/A        | <b>For use in commercial seed treatment facilities only.</b> Use high rates in areas where extended pest control is required. Do not apply a subsequent application of a Group 28 insecticide (anthranilic diamide) in a crop with Lumiderm seed treatment.                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                      | Fortenza                            | 1,333 mL/<br>100 kg seed     | N/A        | <b>For use in commercial seed treatment facilities only.</b> Apply Fortenza as a water-based slurry utilizing standard slurry seed treatment equipment that provides uniform seed coverage. This product contains no colourant. An appropriate colourant must be added when this product is applied. Follow resistance management instructions as stated on label.                                                                                                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | thiamethoxam + difenoconazole + metalaxyl-m + fludioxonil + sedaxane | Helix Vibrance                      | 1.5 L/<br>100 kg seed        | N/A        | <b>For use in commercial seed treatment facilities only.</b> Apply Helix Vibrance using standard commercial seed treatment equipment that provides uniform seed coverage. Do not make any subsequent application of a Group 4 insecticide (e.g., in-furrow or foliar application) following treatment with Helix Vibrance.                                                                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | clothianidin + metalaxyl + metconazole                               | NipsIt Suite Canola Seed Protection | 1.43 L/<br>100 kg seed       | N/A        | <b>For use in commercial seed treatment facilities only.</b> Do not make any subsequent application of a Group 4 insecticide (e.g., in-furrow or foliar application) following treatment with NipsIt Suite.                                                                                                                                                                                                                                                                                                |

## CANOLA AND MUSTARD INSECTS

**Table 6–1.** Chemical Control Options for Insects in Canola and Mustard — Flea Beetles, Diamondback Moth

| <b>LEGEND:</b> PHI = Pre-Harvest Interval (in days) — = no information on label N/A = not applicable                                                                                                                                                                                                                                                                            |                                          |                   |                                  |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-------------------|----------------------------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Integrated Pest Management Options</b>                                                                                                                                                                                                                                                                                                                                       | <b>Active Ingredient</b>                 | <b>Trade Name</b> | <b>Rate</b>                      | <b>PHI</b> | <b>Comments (label precautions, re-entry periods, etc.)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>FLEA BEETLES (<i>Phyllotreta cruciferae</i> and <i>Phyllotreta striolata</i>) (cont'd)</b>                                                                                                                                                                                                                                                                                   |                                          |                   |                                  |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Foliar Treatment</b>                                                                                                                                                                                                                                                                                                                                                         |                                          |                   |                                  |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Honeybees and other pollinators regularly visit canola and mustard flowers. Keep insecticide application to a minimum while the crop is in bloom, to avoid bee-kills. Advise local beekeepers before you apply a pesticide, so that they may take precautions to protect their bees. For more information on preventing bee poisonings, see <i>Bee Poisoning</i> , on page 159. | cypermethrin                             | Mako              | 50 mL/ha<br>(20 mL/acre)         | 30         | <b>For use in canola only. Ground application only.</b> Apply when signs of insect damage appear. Repeat treatment if necessary. Use minimum 110 L/ha of water.<br><br>Toxic to bees and other beneficial insects. Avoid spraying when bees are foraging.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                 | deltamethrin                             | Decis 5 EC        | 100–150 mL/ha<br>(40–60 mL/acre) | 14         | Ground and aerial application. Use a minimum of 100 L/ha of water for ground application. Use a minimum of 11–22 L/ha of water for aerial application. 12-hr re-entry period.<br><br>Toxic to bees for 1 day after application. <b>DO NOT</b> apply when crop or weeds are in bloom.                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                 | lambda-cyhalothrin                       | Matador 120 EC    | 83 mL/ha<br>(33 mL/acre)         | 7          | Ground and aerial application. Maximum 3 applications/yr. Maximum 1 aerial application. 24-hr re-entry period.<br><br>This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.                                                                                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                 |                                          | Silencer 120 EC   |                                  |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                                                                                                                                                                                                                                                                 | carbaryl                                 | Sevin XLR Plus    | 500 mL/ha<br>(200 mL/acre)       | 60         | <b>Ground application only.</b> Seedling stage only (up to 4 weeks after plant emergence).<br><br>This product is highly toxic to honeybees exposed to direct treatment on blooming crops or weeds. Apply Sevin XLR Plus from late evening to early morning or when bees are not foraging.                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                 | permethrin                               | Ambush 500EC      | 70–140 mL/ha<br>(28–57 mL/acre)  | —          | Ground and aerial application. Use higher rate when infestations are severe. Re-entry period as soon as spray has dried. Maximum applications: 2 (ground), 1 (aerial) per season.<br><br>Toxic to bees. Avoid spraying when bees are foraging. Spray deposit should be dry before bees commence foraging in treated crop.                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                 | lambda-cyhalothrin + chlorantraniliprole | Voliam Xpress     | 225 mL/ha<br>(91 mL/ha)          | 7          | To prevent migration of overwintering beetles, ground spray a 15-m strip around the field at the first sign of flea beetle feeding. Maximum of 3 applications/yr by ground, 1 application/yr by air. Apply in a minimum of 100–200 L of water/ha for ground applications, 40 L of water/ha for aerial applications. Do not apply Voliam Xpress following a Group 28 insecticide (e.g., Lumiderm) seed treatment.<br><br>This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. |

## CANOLA AND MUSTARD INSECTS

**Table 6–1.** Chemical Control Options for Insects in Canola and Mustard — Flea Beetles, Diamondback Moth

| <b>LEGEND:</b> PHI = Pre-Harvest Interval (in days)      — = no information on label      N/A = not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                          |                   |                                    |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-------------------|------------------------------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Integrated Pest Management Options</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Active Ingredient</b>                 | <b>Trade Name</b> | <b>Rate</b>                        | <b>PHI</b> | <b>Comments (label precautions, re-entry periods, etc.)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>DIAMONDBACK MOTH (<i>Plutella xylostella</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                          |                   |                                    |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Foliar Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                          |                   |                                    |            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <p>Damage by diamondback moth is most noticeable during dry years. Risk factors include weedy fields and no-till practices. Cool, cloudy weather reduces moth activity and if this persists, females will die before eggs are laid.</p> <p>Honeybees and other pollinators regularly visit canola and mustard flowers. Keep insecticide application to a minimum while the crop is in bloom to avoid bee-kills. Advise local beekeepers before you apply a pesticide, so that they may take precautions to protect their bees. For more information on preventing bee poisonings, see <i>Bee Poisoning</i>, on page 159.</p> | lambda-cyhalothrin                       | Matador 120 EC    | 83 mL/ha<br>(33 mL/acre)           | 7          | Ground and aerial application. Maximum 3 applications/yr. Maximum 1 aerial application. 24-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                          | Silencer 120 EC   |                                    |            | This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.                                                                                                                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | chlorantraniliprole                      | Coragen           | 250–375 mL/ha<br>(101–151 mL/acre) | 1          | <b>Ground application only.</b> Do not apply this product if following a seed treatment of a Group 28 insecticide (anthranilic diamide) within that season. For ground application, use a minimum water volume of 100 L/ha. Use high rate of Coragen under heavy pest pressure. Minimum of 3 days between applications. Maximum 3 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | lambda-cyhalothrin + chlorantraniliprole | Voliam Xpress     | 225 mL/ha<br>(91 mL/ha)            | 7          | Maximum of 3 applications/yr by ground, 1 application/yr by air. Apply in a minimum of 100–200 L of water/ha for ground applications, 40 L of water/ha for aerial applications. Do not apply Voliam Xpress following a Group 28 insecticide (e.g., Lumiderm) seed treatment.<br><br>This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. |

## CANOLA AND MUSTARD INSECTS

**Table 6–2.** Chemical Control Options for Insects in Canola and Mustard — Cabbage Seedpod Weevil, Swede Midge, Tarnished Plant Bug, Cutworm

| LEGEND: PHI = Pre-Harvest Interval (in days)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                          | N/A = not applicable |                       |                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|----------------------|-----------------------|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Active Ingredient                        | Trade Name           | Rate                  | PHI                             | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                           |
| CABBAGE SEEDPOD WEEVIL ( <i>Ceutorhynchus obstrictus</i> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                          |                      |                       |                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                           |
| This is a serious pest in winter canola, though it can also impact early-planted spring canola. Adult weevils lay eggs directly into the seedpod. Pod feeding by the larvae can cause up to 35% yield loss. Apply insecticide to adults prior to egg-laying, as foliar insecticide will not control larvae within the canola pod.                                                                                                                                                                                                                                                               | lambda-cyhalothrin                       | Matador 120 EC       | 83 mL/ha (33 mL/acre) | 7                               | For adult control only. Ground and aerial application. Apply at bud-to-early-flowering stage. Maximum 1 application/yr. 24-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                          | Silencer 120 EC      |                       |                                 | This product is toxic to bees when exposed to direct treatment, drift, or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                           |
| See the OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , for further information on pest biology and management options.<br><br>Honeybees and other pollinators regularly visit canola and mustard flowers. Keep insecticide application to a minimum while the crop is in bloom to avoid bee-kills. Advise local beekeepers before you apply a pesticide, so that they may take precautions to protect their bees. For more information on preventing bee poisonings, see <i>Bee Poisoning</i> , on page 159.                                                                   | lambda-cyhalothrin + chlorantraniliprole | Voliam Xpress        | 225 mL/ha (91 mL/ha)  | 7                               | Apply at the bud to early flowering stage. Make only 1 application per season by either ground or aerial. Apply in a minimum of 100–200 L of water per hectare for ground applications, 40 L of water per hectare for aerial applications. Do not apply Voliam Xpress following a Group 28 insecticide (e.g., Lumiderm) seed treatment.<br><br>This product is toxic to bees when exposed to direct treatment, drift, or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. |                                                                                                                                                                                                                                                                                                                                                                           |
| SWEDE MIDGE ( <i>Contarinia nasturtii</i> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                          |                      |                       |                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                           |
| Swede midge is a serious pest of spring canola, though winter canola can experience damage. Under heavy midge infestations, later-planted spring canola plants may experience stunting and malformed growth, with extremely reduced flower and pod formation. Fields planted later than the first week of June are at significantly increased risk of swede midge damage.<br><br>Go to <a href="http://www.ontariocanola growers.ca">www.ontariocanola growers.ca</a> for up-to-date management recommendations. Timing of insecticides is critical and is based on pheromone trapping results. | lambda-cyhalothrin                       | Matador 120 EC       | 83 mL/ha (34 mL/acre) | 7                               | Ground and aerial application. Use 100–200 L of water/ha. Allow a 7-day interval between treatments. Maximum 3 applications/yr. Do not apply more than 2 applications by air. 24-hr re-entry period.<br><br>This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                          | Silencer 120 EC      | 83 mL/ha (34 mL/acre) | 7                               | Ground and aerial application. Use 100–200 L of water/ha. Allow a 7-day interval between treatments. Maximum 3 applications/yr. Do not apply more than 2 applications by air. 24-hr re-entry period.<br><br>This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site.                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                          | chlorantraniliprole  | Coragen               | 250–375 mL/ha (101–151 mL/acre) | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Ground application only.</b> Do not apply this product if following a seed treatment of a Group 28 insecticide (anthranilic diamide) within that season. For ground application, use a minimum water volume of 100 L/ha. Use high rate of Coragen under heavy pest pressure. Minimum of 3 days between applications. Maximum 3 applications/yr. 12-hr re-entry period. |

## CANOLA AND MUSTARD INSECTS

**Table 6–2.** Chemical Control Options for Insects in Canola and Mustard — Cabbage Seedpod Weevil, Swede Midge, Tarnished Plant Bug, Cutworm

| LEGEND: PHI = Pre-Harvest Interval (in days)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                          | N/A = not applicable |                          |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|----------------------|--------------------------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Active Ingredient                        | Trade Name           | Rate                     | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| TARNISHED PLANT BUG ( <i>Lygus lineolaris</i> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                          |                      |                          |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Foliar Treatment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                          |                      |                          |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Tarnished plant bugs sting plant tissue, including pods and flowers. This causes scarring, malformation and dimpling or pitting on pods. They can also drill into the seed. If flowers are still present, they can prick the flower and cause it to abort. Spraying is warranted when 2 bugs per sweep are found after petal fall, prior to pod maturity.<br><br>Honeybees and other pollinators regularly visit canola and mustard flowers. Keep insecticide application to a minimum while the crop is in bloom to avoid bee-kills. Advise local beekeepers before you apply a pesticide, so that they may take precautions to protect their bees. For more information on preventing bee poisonings, see <i>Bee Poisoning</i> , on page 159. | lambda-cyhalothrin                       | Matador 120 EC       | 83 mL/ha<br>(33 mL/acre) | 7   | Ground and aerial application. Maximum 3 applications/yr. Maximum 1 aerial application. 24-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                          | Silencer 120 EC      |                          |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | lambda-cyhalothrin + chlorantraniliprole | Voliam Xpress        | 225 mL/ha<br>(91 mL/ha)  | 7   | Apply at the bud-to-early-flowering stage. Make only 1 application per season by either ground or aerial. Apply in a minimum of 100–200 L of water/ha for ground applications, 40 L of water/ha for aerial applications. Do not apply Voliam Xpress following a Group 28 insecticide (e.g., Lumiderm) seed treatment.<br><br>This product is toxic to bees when exposed to direct treatment, drift or residues on flowering crops or weeds. <b>DO NOT</b> apply this product to flowering crops or weeds if bees are visiting the treatment area. Minimize spray drift to reduce harmful effects on bees in habitats close to the application site. |
| CUTWORM (Various species)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                          |                      |                          |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Seed Treatment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                          |                      |                          |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Most commonly found in Northern Ontario. Larvae hatch in the spring and feed on the seedling crop before pupating mid-summer. Adult moths emerge and lay eggs late in the summer or early fall near weedy plants within the field. Practise good weed management to reduce attractiveness of adult moths during egg laying (typically August).                                                                                                                                                                                                                                                                                                                                                                                                  | cyantraniliprole                         | Fortenza             | 500 mL/<br>100 kg seed   | N/A | <b>For use in commercial seed treatment facilities only.</b> Apply Fortenza as a water-based slurry utilizing standard slurry seed treatment equipment that provides uniform seed coverage. This product contains no colourant. An appropriate colourant must be added when this product is applied. Follow resistance management instructions as stated on label.                                                                                                                                                                                                                                                                                  |

## CANOLA AND MUSTARD DISEASES

**Table 6–3.** Chemical Control Options for Seedling Diseases in Canola and Mustard — Seed Rot and Seedling Blight, Pythium Damping-Off

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                  | Active Ingredient                                                    | Trade Name            | Rate                                            | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|-----------------------|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SEED ROT and SEEDLING BLIGHT (<i>Alternaria</i>, <i>Fusarium</i> and <i>Rhizoctonia</i> spp.)</b>                                                                                                                                                                                                                |                                                                      |                       |                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Seed Treatment</b>                                                                                                                                                                                                                                                                                               |                                                                      |                       |                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Plant good quality seed under conditions that promote rapid germination (warm temperatures). Using a fungicide seed treatment will increase stand establishment. Maintain a good fertility balance and avoid excess fertilizer, which promotes disease and phytotoxicity. Avoid deep planting of seed.              | carbathiin + thiram                                                  | Vitavax RS Fungicide  | 833 mL/100 kg seed                              | Do not graze or feed livestock on seed area for 4 weeks after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|                                                                                                                                                                                                                                                                                                                     | imidacloprid + carbathiin + thiram                                   | Gaucho CS FL          | 1.4 L/100 kg seed                               | <b>For use in commercial seed treatment facilities only.</b> Not for use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment application. Do not graze livestock on treated areas for 4 weeks after planting. Do not use mustard greens that have had Gaucho CS FL seed treatment for human consumption. Follow resistance management instructions as stated on label.                                                                                                                                                                                                                                                                      |
|                                                                                                                                                                                                                                                                                                                     | thiamethoxam + difenoconazole + metalaxyl-m + fludioxonil + sedaxane | Helix Vibrance        | 1.5 L/100 kg seed                               | <b>For use in commercial seed treatment facilities only.</b> Apply Helix Vibrance using standard commercial seed treatment equipment that provides uniform seed coverage. Do not make any subsequent application of a Group 4 insecticide (e.g., in-furrow or foliar application) following treatment with Helix Vibrance.                                                                                                                                                                                                                                                                                                                                            |
| <b>PYTHIUM DAMPING-OFF (<i>Pythium</i> spp.)</b>                                                                                                                                                                                                                                                                    |                                                                      |                       |                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Plant good quality seed under conditions that promote rapid germination (warm temperatures). Using metalaxyl or metalaxyl-M seed treatment will increase stand establishment. Maintain a good fertility balance and avoid excess fertilizer, which promotes disease and phytotoxicity. Avoid deep planting of seed. | metalaxyl-M                                                          | Apron XL LS           | 20–40 mL/100 kg seed                            | <b>For use in canola only. For use in commercial seed treatment facilities only.</b> Do not use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment applications at or immediately before planting. Read label for information regarding resistant strains of fungus.                                                                                                                                                                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                                                                                                                     | metalaxyl                                                            | Apron FL              | 32–110 mL/100 kg seed                           | <b>For use in canola only.</b> Do not graze or feed livestock on seeded area for 4 weeks after planting.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|                                                                                                                                                                                                                                                                                                                     | ethaboxam                                                            | Intego Solo Fungicide | 13–19.6 mL/100 kg seed (5–7.5 g ai/100 kg seed) | For commercial and on-farm treating. Regulations under the <i>Seeds Act</i> require that an appropriate colourant must be added when this product is applied to seed. A baby blue colourant must be added when this product is applied to canola/rapeseed.<br><br>For best results, use Intego Solo Fungicide combined with other oomycete-active seed treatment fungicides, such as metalaxyl, to broaden the spectrum of activity. Intego Solo Fungicide can also be used in combination with a broad-spectrum registered seed treatment fungicide having activity against <i>Rhizoctonia solani</i> and other fungal pathogens inciting seed and seedling disease. |
|                                                                                                                                                                                                                                                                                                                     | thiamethoxam + difenoconazole + metalaxyl-m + fludioxonil + sedaxane | Helix Vibrance        | 1.5 L/100 kg seed                               | <b>For use in commercial seed treatment facilities only.</b> Apply Helix Vibrance using standard commercial seed treatment equipment that provides uniform seed coverage. Do not make any subsequent application of a Group 4 insecticide (e.g., in-furrow or foliar application) following treatment with Helix Vibrance.                                                                                                                                                                                                                                                                                                                                            |

## CANOLA AND MUSTARD DISEASES

**Table 6–4.** Chemical Control Options for Seedling Diseases in Canola and Mustard — Blackleg

| LEGEND: PHI = Pre-Harvest Interval (in days)                                                                                                                                                                                                   |                                                                      | N/A = not applicable |                                 |     |                                                                                                                                                                                                                                                                                                                                                                                                  |  |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|----------------------|---------------------------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Integrated Pest Management Options                                                                                                                                                                                                             | Active Ingredient                                                    | Trade Name           | Rate                            | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                             |  |
| BLACKLEG ( <i>Leptosphaeria maculans</i> )                                                                                                                                                                                                     |                                                                      |                      |                                 |     |                                                                                                                                                                                                                                                                                                                                                                                                  |  |
| Seed Treatment                                                                                                                                                                                                                                 |                                                                      |                      |                                 |     |                                                                                                                                                                                                                                                                                                                                                                                                  |  |
| There are differences in susceptibility to blackleg between cultivars. Consult with your seed company for variety information.<br><br>Maintain at least 3 yr between canola crops. Fungicide seed treatments will reduce seed-borne infection. | carbathiin + thiram                                                  | Vitavax RS Fungicide | 833 mL/100 kg seed              | N/A | Do not graze or feed livestock on seed area for 4 weeks after planting.                                                                                                                                                                                                                                                                                                                          |  |
|                                                                                                                                                                                                                                                | imidacloprid + carbathiin + thiram                                   | Gaucha CS FL         | 1.4 L/100 kg seed               | N/A | <b>For use in commercial seed treatment facilities only.</b> Not for use in hopper-box, planter-box, slurry-box or other non-commercial seed treatment application. Do not graze livestock on treated areas for 4 weeks after planting. Do not use mustard greens that have had Gaucha CS FL seed treatment for human consumption. Follow resistance management instructions as stated on label. |  |
|                                                                                                                                                                                                                                                | thiamethoxam + difenoconazole + metalaxyl-m + fludioxonil + sedaxane | Helix Vibrance       | 1.5 L/100 kg seed               | N/A | <b>For use in commercial seed treatment facilities only.</b> Apply Helix Vibrance using standard commercial seed treatment equipment that provides uniform seed coverage. Do not make any subsequent application of a Group 4 insecticide (e.g., in-furrow or foliar application) following treatment with Helix Vibrance.                                                                       |  |
| Foliar Treatment                                                                                                                                                                                                                               |                                                                      |                      |                                 |     |                                                                                                                                                                                                                                                                                                                                                                                                  |  |
| A foliar fungicide may be warranted if blackleg symptoms occur at the seedling and rosette stages or if a susceptible variety is being grown. Consult with your seed company for variety information.                                          | propiconazole                                                        | Tilt 250 E           | 500 mL/ha (200 mL/acre)         | 60  | <b>For use in canola only.</b> Ground and aerial application. Apply at rosette stage, between 2nd true leaf and bolting.                                                                                                                                                                                                                                                                         |  |
|                                                                                                                                                                                                                                                |                                                                      | Bumper 418 EC        | 300 mL/ha (121 mL/acre)         | 60  | <b>For use in canola only.</b> Ground and aerial application. Apply at rosette stage, between 2nd true leaf and bolting.                                                                                                                                                                                                                                                                         |  |
|                                                                                                                                                                                                                                                | azoxystrobin                                                         | Quadris              | 500 mL/ha (200 mL/acre)         | 30  | <b>For use in canola only.</b> Apply at 2–6-leaf stage. See label for information regarding resistant strains of fungus. Plant-back interval of 30 days for broadleaf and root crops and 45 days for cereals required.                                                                                                                                                                           |  |
|                                                                                                                                                                                                                                                | pyraclostrobin                                                       | Headline             | 300–400 mL/ha (120–160 mL/acre) | 21  | Apply at the 2–6-leaf stage for black leg and 20%–50% bloom- (suppression only)-to-early-pod stage (90% bloom) in canola for alternaria black spot. Use the higher rate when conditions are conducive to heavy disease development. Use a minimum of 100 L/ha of water for ground application and 50 L/ha of water for aerial application. Maximum 2 applications/yr. 12-hr re-entry period.     |  |
|                                                                                                                                                                                                                                                | azoxystrobin + propiconazole                                         | Quilt                | 1.0 L/ha (406 mL/acre)          | 30  | Ground and aerial application. Apply during the rosette stage between 2nd true leaf and bolting. Maximum 1 application/yr. 12-hr re-entry period. Apply a minimum of 100 L of water/ha for ground application and 45 L of water/ha for aerial application.                                                                                                                                       |  |
|                                                                                                                                                                                                                                                | pyraclostrobin + fluxapyroxad                                        | Priaxor              | 0.225–0.3 L/ha (90–120 mL/acre) | 21  | Ground and aerial application. Apply at the 2-to-6-leaf (rosette) stage. Use the higher rate under high disease pressure. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                      |  |

## CANOLA AND MUSTARD DISEASES

**Table 6–5.** Chemical Control Options for Seedling Diseases in Canola and Mustard — *Sclerotinia* Stem Rot**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                     | Active Ingredient           | Trade Name        | Rate                                 | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-------------------|--------------------------------------|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SCLEROTINIA STEM ROT (WHITE MOULD) (<i>Sclerotinia sclerotiorum</i>)</b>                                                                                                                                                                                                                                                                                                                                                                                            |                             |                   |                                      |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Foliar Treatment</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                |                             |                   |                                      |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| This disease is often a problem when canola follows canola, dry edible beans, soybeans or sunflowers. Use clean seed and a 4–5-yr rotation with non-host crops such as corn, wheat, barley or oats. At present, no resistant varieties exist. Keep fields clean of broad-leaved weeds, since many are alternate hosts. The disease is very destructive during periods of prolonged, wet weather. Losses of up to 50% can occur under conditions ideal for the disease. | prothioconazole             | Proline           | 315–368 mL/ha<br>(128–149 mL/acre)   | 36  | Ground and aerial application. Apply when the crop is in the 20%–50% bloom stage. Best protection will be achieved when applied prior to petals beginning to fall. Higher rate is recommended for fields with a history of heavy disease pressure or for dense plant stands. Good spray coverage is essential. The lowest label rate of a non-ionic surfactant, AgSurf or Agral 90 may be tank-mixed. Maximum 1 application/yr. 24-hr re-entry period. |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | cyprodinil<br>+ fludioxonil | Astound           | 775–975 g/ha<br>(314–395 g/acre)     | 35  | Ground and aerial application. Apply 1 application at 20%–30% bloom stage. Use a minimum of 200 L/ha of water for ground application. Use a minimum of 45 L/ha of water for aerial application. Apply the higher rate under conditions of high disease pressures. Maximum 1 application/yr. 12-hr re-entry period.                                                                                                                                     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | iprodione                   | Overall<br>240 SC | 2.1–3.1 L/ha<br>(850–1,255 mL/acre)  | 14  | <b>For use in canola only.</b> Ground and aerial application. Use a minimum of 100 L/ha of water for ground application. Use a minimum of 45 L/ha of water for aerial application. Apply at 20%–30% bloom. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                             | Rovral WP         | 1.0–1.5 kg/ha<br>(0.4–0.6 kg/acre)   | 14  | <b>For use in canola only.</b> Ground and aerial application. Use a minimum of 45 L/ha of water for aerial application. Apply at 20%–30% bloom. 12-hr re-entry period.                                                                                                                                                                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | azoxystrobin                | Quadris           | 700–1,000 mL/ha<br>(283–405 mL/acre) | 30  | <b>For use in canola only.</b> Apply at early bloom (prior to 30% bloom). Use the higher rate if there is a history of infection in the area and when environmental conditions favour disease development. See label for information regarding resistant strains of fungus. Plant-back interval of 30 days for broadleaf and root crops and 45 days for cereals required.                                                                              |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | boscalid                    | Lance             | 350 g/ha<br>(142 g/acre)             | 21  | Ground and aerial application. Apply at 20%–50% flowering. Apply a second time, 7–10 days later, up to 50% flowering, if disease persists or weather conditions are favourable for disease development. Do not tank-mix with insecticide, as this fungicide could affect insecticide efficacy. 4-hr re-entry period.                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | penthiopyrad                | Vertisan          | 1.25–1.5 L/ha<br>(0.5–0.6 L/acre)    | 21  | Ground and aerial application. Begin applications at 20%–25% bloom prior to disease development. Under high disease pressure, make a 2nd application 7–14 days later. Use higher rate and shorter interval when disease pressure is high. Do not apply more than 2 sequential applications before switching to a fungicide with a different mode of action. Maximum 3 L/ha/yr. 12-hr re-entry period.                                                  |

## CANOLA AND MUSTARD DISEASES

**Table 6–5.** Chemical Control Options for Seedling Diseases in Canola and Mustard — Sclerotinia Stem Rot**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                   | Active Ingredient             | Trade Name   | Rate                               | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------------------------------------------------------------------|-------------------------------|--------------|------------------------------------|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SCLEROTINIA STEM ROT (WHITE MOULD) (<i>Sclerotinia sclerotiorum</i>) (cont'd)</b> |                               |              |                                    |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| (cont'd)                                                                             | <i>Coniothyrium minitans</i>  | Contans WG   | 0.5–4 kg/ha<br>(0.20–1.6 kg/acre)  | 0   | <b>Provides suppression only. Ground application only.</b> This product should be applied at least 3 months prior to anticipated outbreak (e.g., prior to planting). Product should be incorporated as thoroughly as possible to a depth of 5–20 cm. Rate should be increased to 2–4 kg/ha (0.8–1.6 kg/acre) if incorporated to a depth greater than 5 cm. A post-harvest application may be applied in the fall to treat the soil prior to spring planting of a susceptible crop. Treated soils in the fall should not be disturbed to avoid bringing untreated sclerotia from lower soil layers to the top soil layer. Maximum 2 applications/yr. |
|                                                                                      | <i>Bacillus subtilis</i>      | Serenade ASO | 1.0–4.0 L/ha<br>(0.4–1.6 L/acre)   | 0   | <b>Provides suppression only.</b> Ground and aerial application. Under conditions of moderate-to-high disease pressure, use the higher rate and shorter application intervals. For maximum effectiveness, apply prior to, or at the early stages of, disease development. Apply in sufficient water volume to ensure full coverage for effective control. Repeat as necessary on a 7–10-day interval.                                                                                                                                                                                                                                               |
|                                                                                      | metconazole                   | Quash        | 280 g/ha<br>(113.3 g/acre)         | 45  | Ground and aerial application. Apply prior to disease development. Make first application at 20%–50% bloom stage, before disease symptoms are visible. Make a second application at full bloom (minimum 7-day interval). Do not make more than 2 applications or apply more than 560 g/ha per season.                                                                                                                                                                                                                                                                                                                                               |
|                                                                                      | picoxystrobin                 | Acapela      | 0.80–1.2 L/ha<br>(320–490 mL/acre) | 28  | Ground and aerial application. Apply at 20%–50% bloom prior to disease development to control white mould. Use the higher rate or shorter interval when disease pressure is high. Under high disease pressure, make a second application of another fungicide, from a different fungicide group, 7–14 days later. A second application of Acapela fungicide can only be carried out if both applications are at the lowest rate and if sprays are not sequential. Use the high rate under heavy pest pressure. Maximum seasonal use rate is 1.75 L/ha. Maximum 2 applications/yr. 12-hr re-entry period.                                            |
|                                                                                      | pyraclostrobin + fluxapyroxad | Priaxor      | 0.45 L/ha<br>(180 mL/acre)         | 21  | <b>Provides suppression only.</b> Ground and aerial application. Apply at 20%–50% flower. Maximum 2 applications/yr. 12-hr re-entry period.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

## CANOLA AND MUSTARD DISEASES

**Table 6–6.** Chemical Control Options for Seedling Diseases in Canola and Mustard — *Alternaria* Black Spot**LEGEND:** PHI = Pre-Harvest Interval (in days)

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                    | Active Ingredient             | Trade Name | Rate                               | PHI | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|------------|------------------------------------|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>ALTERNARIA BLACK SPOT (<i>Alternaria brassicae</i> and <i>A. raphani</i>)</b>                                                                                                                                                                                                                                                                                      |                               |            |                                    |     |                                                                                                                                                                                                                                                                                              |
| <b>Foliar Treatment</b>                                                                                                                                                                                                                                                                                                                                               |                               |            |                                    |     |                                                                                                                                                                                                                                                                                              |
| The disease is more prominent in other canola areas of Canada and is sporadic in Ontario. The fungus produces black lesions that can infect all parts of the plant but is especially problematic when it causes pod shatter. Crop rotation, tillage of residues, use of less susceptible variety and timely harvest can reduce impact. Fungicides are very effective. | pyraclostrobin + fluxapyroxad | Priaxor    | 0.225–0.3 L/ha<br>(90–120 mL/acre) | 21  | Ground and aerial application. Use the high rate under high disease pressure. Applications at 20%–50% bloom will provide suppression of alternaria black spot, whereas applications at early pod stage will control alternaria black spot. Maximum 2 applications/yr. 12-hr re-entry period. |

## 7. Stored Grain

### STORED-GRAIN INSECTS

**Table 7-1.** Chemical Control Options for Insects in Stored Corn, Wheat and Soybeans — Rusty Grain Beetle

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                    | Active Ingredient  | Trade Name | Rate                                                                                                                                               | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>RUSTY GRAIN BEETLE (<i>Cryptolestes ferrugineus</i>)</b><br>This beetle feeds on cracked or sound grain. Damage can be throughout the pile of grain. High infestations generate heat, causing grain to mould. The key to controlling stored-grain insects is prevention through good sanitation and storage practices. See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , for more information on stored-grain insect management. |                    |            |                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Protectant</b>                                                                                                                                                                                                                                                                                                                                                                                                                                     |                    |            |                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| The key to controlling stored-grain insects is prevention through good sanitation and storage practices. See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , for more information on stored-grain insect management.                                                                                                                                                                                                                  | diatomaceous earth | Protect-It | Empty bin:<br>500 g/100 m <sup>2</sup><br><br>Stored grain:<br>500–1,000 g/<br>metric tonne of grain                                               | This product can be applied to dry containers where grain is transported or stored. The structure must remain empty for 1–2 weeks. For maximum effectiveness, the relative humidity must remain below 55% and the temperature above 15°C. See label for spot and crack treatment rates. For wheat grain treatment, 100 g/tonne of wheat can be used to control rusty grain beetle. Dust may be applied to grain as it enters the auger or conveyor feeder system during grain transfer into the storage facility. |
| <b>Fumigant</b>                                                                                                                                                                                                                                                                                                                                                                                                                                       |                    |            |                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| The key to controlling stored-grain insects is prevention through good sanitation and storage practices. See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , for more information on stored-grain insect management.                                                                                                                                                                                                                  | aluminum phosphide | Fumitoxin  | 880–2,560 pellets<br>250–500 tablets<br>/100 m <sup>3</sup> grain bin<br><br>880–2,500 pellets<br>180–500 tablets<br>/100 m <sup>3</sup> grain bin | These products must be applied by a professional licensed applicator. Do not fumigate below 5°C. Exposure to moist air or liquids releases flammable and toxic phosphine gas. Ensure bin is tightly sealed. Not to be used for vacuum fumigations. See label for minimum length of pest exposure periods at various temperatures.                                                                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                    | Phostoxin  |                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                    | Gastoxin   |                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

## STORED-GRAIN INSECTS

**Table 7–2.** Chemical Control Options for Insects in Stored Corn, Wheat and Soybeans — Indian Meal Moth

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                                                                                              | Active Ingredient  | Trade Name | Rate                                                                                                 | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------|------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>INDIAN MEAL MOTH (<i>Plodia interpunctella</i>)</b><br>This moth is resistant to malathion. Larvae spin webbing. High populations result in a mat of grain with silks up to 50 cm deep. Remove webbed layer of grain before fumigation. The key to controlling stored-grain insects is prevention through good sanitation and storage practices. See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , for more information on stored-grain insect management. |                    |            |                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Protectant</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                    |            |                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| The key to controlling stored-grain insects is prevention through good sanitation and storage practices. See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , for more information on stored-grain insect management.                                                                                                                                                                                                                                            | diatomaceous earth | Protect-It | Empty bin:<br>500 g/100 m <sup>2</sup><br><br>Stored grain:<br>500–1,000 g/<br>metric tonne of grain | Apply at monthly intervals with the first appearance of moths and continue until early fall. In severe infestations, break up webbing with a rake before dusting and make second application 2 weeks later. Can be applied to dry containers where grain is transported or stored. The structure must remain empty for 1–2 weeks. For maximum effectiveness, the relative humidity must remain below 55% and the temperature above 15°C. See label for spot and crack treatment rates. Dust may be applied to grain as it enters the auger or conveyor feeder system during grain transfer into storage facility. |
| <b>Fumigant</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                    |            |                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| The key to controlling stored-grain insects is prevention through good sanitation and storage practices. See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , for more information on stored-grain insect management.                                                                                                                                                                                                                                            | aluminum phosphide | Fumitoxin  | 880–2,560 pellets<br>250–500 tablets<br>/100 m <sup>3</sup> grain bin                                | These products must be applied by a professional licensed applicator. Do not fumigate below 5°C. Exposure to moist air or liquids releases flammable and toxic phosphine gas. Ensure bin is tightly sealed. Not to be used for vacuum fumigations. See label for minimum length of pest exposure periods at various temperatures.                                                                                                                                                                                                                                                                                 |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                    | Phostoxin  |                                                                                                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                    | Gastoxin   | 880–2,500 pellets<br>180–500 tablets<br>/100 m <sup>3</sup> grain bin                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

## STORED-GRAIN INSECTS

**Table 7–3.** Chemical Control Options for Insects in Stored Corn, Wheat and Soybeans — Granary Weevil, Lesser Grain Borer

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                                              | Active Ingredient  | Trade Name | Rate                                                                                                     | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------|----------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>GRANARY WEEVIL (<i>Sitophilus granarius</i>)</b><br>Both adults and larvae feed on sound grain. Larvae spend their entire life in one kernel, feeding on the endosperm. The key to controlling stored-grain insects is prevention through good sanitation and storage practices. See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , for more information on stored-grain insect management. |                    |            |                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Protectant</b>                                                                                                                                                                                                                                                                                                                                                                                               |                    |            |                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| The key to controlling stored-grain insects is prevention through good sanitation and storage practices. See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , for more information on stored-grain insect management.                                                                                                                                                                            | diatomaceous earth | Protect-It | Empty bin:<br>500 g per 100 m <sup>2</sup><br><br>Stored grain:<br>500–1,000 g/<br>metric tonne of grain | This product can be applied to dry containers where grain is transported or stored. The structure must remain empty for 1–2 weeks. For maximum effectiveness, the relative humidity must remain below 55% and the temperature above 15°C. See label for spot and crack treatment rates. Dust may be applied to grain as it enters the auger or conveyor feeder system during grain transfer into the storage facility. |
| <b>Fumigant</b>                                                                                                                                                                                                                                                                                                                                                                                                 |                    |            |                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| The key to controlling stored-grain insects is prevention through good sanitation and storage practices. See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , for more information on stored-grain insect management.                                                                                                                                                                            | aluminum phosphide | Fumitoxin  | 880–2,560 pellets<br>250–500 tablets<br>/100 m <sup>3</sup> grain bin                                    | These products must be applied by a professional licensed applicator. Do not fumigate below 5°C. Exposure to moist air or liquids releases flammable and toxic phosphine gas. Ensure bin is tightly sealed. Not to be used for vacuum fumigations. See label for minimum length of pest exposure periods at various temperatures.                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                 |                    | Phostoxin  |                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                 |                    | Gastoxin   | 880–2,500 pellets<br>180–500 tablets<br>/100 m <sup>3</sup> grain bin                                    |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>LESSER GRAIN BORER (<i>Rhyzopertha dominica</i>)</b>                                                                                                                                                                                                                                                                                                                                                         |                    |            |                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Fumigant</b>                                                                                                                                                                                                                                                                                                                                                                                                 |                    |            |                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                        |
| The key to controlling stored-grain insects is prevention through good sanitation and storage practices. See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , for more information on stored-grain insect management.                                                                                                                                                                            | aluminum phosphide | Fumitoxin  | 880–2,560 pellets<br>250–500 tablets<br>/100 m <sup>3</sup> grain bin                                    | These products must be applied by a professional licensed applicator. Do not fumigate below 5°C. Exposure to moist air or liquids releases flammable and toxic phosphine gas. Ensure bin is tightly sealed. Not to be used for vacuum fumigations. See label for minimum length of pest exposure periods at various temperatures.                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                 |                    | Phostoxin  |                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                                                                                                                                                                                                                                                                                                                                                                                                                 |                    | Gastoxin   | 880–2,500 pellets<br>180–500 tablets<br>/100 m <sup>3</sup> grain bin                                    |                                                                                                                                                                                                                                                                                                                                                                                                                        |

## STORED-GRAIN INSECTS

**Table 7–4.** Chemical Control Options for Insects in Stored Corn, Wheat and Soybeans — Pea Weevils/Bean Weevils, European Grain Moth

| Integrated Pest Management Options                                                                                                                                                                                                                                                                                                                                                 | Active Ingredient  | Trade Name | Rate                                                      | Comments (label precautions, re-entry periods, etc.)                                                                                                                                                                                                                                                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------|-----------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PEA WEEVILS/BEAN WEEVILS ( <i>Bruchus pisorum</i> / <i>Acanthoscelides obtectus</i> )                                                                                                                                                                                                                                                                                              |                    |            |                                                           |                                                                                                                                                                                                                                                                                                                                   |
| Fumigant                                                                                                                                                                                                                                                                                                                                                                           |                    |            |                                                           |                                                                                                                                                                                                                                                                                                                                   |
| Adults lay their eggs in maturing beans in the field with no apparent visible damage. Heavily infested peas or beans can be fed to livestock. The key to controlling stored-grain insects is prevention through good sanitation and storage practices. See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , for more information on stored-grain insect management. | aluminum phosphide | Fumitoxin  | 880–2,560 pellets<br>250–500 tablets<br>/100 m³ grain bin | These products must be applied by a professional licensed applicator. Do not fumigate below 5°C. Exposure to moist air or liquids releases flammable and toxic phosphine gas. Ensure bin is tightly sealed. Not to be used for vacuum fumigations. See label for minimum length of pest exposure periods at various temperatures. |
|                                                                                                                                                                                                                                                                                                                                                                                    |                    | Phostoxin  |                                                           |                                                                                                                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                    |                    | Gastoxin   | 880–2,500 pellets<br>180–500 tablets<br>/100 m³ grain bin |                                                                                                                                                                                                                                                                                                                                   |
| EUROPEAN GRAIN MOTH ( <i>Nemapogon granella</i> )                                                                                                                                                                                                                                                                                                                                  |                    |            |                                                           |                                                                                                                                                                                                                                                                                                                                   |
| Fumigant                                                                                                                                                                                                                                                                                                                                                                           |                    |            |                                                           |                                                                                                                                                                                                                                                                                                                                   |
| Similar to Indian meal moth, the larvae of this pest spin webbing on the grain, which can typically be found within the top 50 cm. The key to controlling stored-grain insects is prevention through good sanitation and storage practices. See OMAFRA Publication 811, <i>Agronomy Guide for Field Crops</i> , for more information on stored-grain insect management.            | aluminum phosphide | Fumitoxin  | 880–2,560 pellets<br>250–500 tablets<br>/100 m³ grain bin | These products must be applied by a professional licensed applicator. Do not fumigate below 5°C. Exposure to moist air or liquids releases flammable and toxic phosphine gas. Ensure bin is tightly sealed. Not to be used for vacuum fumigations. See label for minimum length of pest exposure periods at various temperatures. |
|                                                                                                                                                                                                                                                                                                                                                                                    |                    | Phostoxin  |                                                           |                                                                                                                                                                                                                                                                                                                                   |
|                                                                                                                                                                                                                                                                                                                                                                                    |                    | Gastoxin   | 880–2,500 pellets<br>180–500 tablets<br>/100 m³ grain bin |                                                                                                                                                                                                                                                                                                                                   |

## 8. Using Pesticides in Ontario

The information in this chapter is updated regularly. For up-to-date information, visit [ontario.ca/usingpesticides](http://ontario.ca/usingpesticides). Some of the information in this generic chapter may not apply to all crops.

**Read the label before use.**

**Product labels may change.**

**Review the Grower Pesticide Safety Course Manual.**  
**[www.opep.ca/index.cfm/learning-resources/e-manuals/](http://www.opep.ca/index.cfm/learning-resources/e-manuals/)**

**Keep detailed spray records.**

### Federal Registration of Pesticides

Before a pesticide can be sold or used in Ontario, it must be registered under the federal *Pest Control Products Act* (PCP Act) and be classified under the provincial *Pesticides Act*. The Pest Management Regulatory Agency (PMRA) of Health Canada registers pesticides for use in Canada following an evaluation of scientific data to ensure that the product has value. It also ensures that any human health and environmental risks associated with its proposed uses are acceptable.

The PMRA re-evaluates registered pesticides to determine whether today's health and environmental protection standards are still met when the pesticide is used according to the label. Outcomes of a re-evaluation can be:

- no change to the registration
- amendments to the label (e.g., changes to personal protective equipment requirements, restricted entry intervals, buffer zones)
- modifications to existing Maximum Residue Limits (MRLs)
- elimination or phasing-out of certain uses or formulations
- discontinuation of the registration

**The pesticide label is a legal document.** Follow all label directions. Labels for all registered pesticides are under "Search Pesticide Labels" on the PMRA website at [www.healthcanada.gc.ca/pmra](http://www.healthcanada.gc.ca/pmra). Ensure you have the most current label and are aware of any re-evaluation decisions.

### Regulation of Pesticides in Ontario

The Ministry of the Environment and Climate Change (MOECC) is responsible for regulating the sale, use, transportation, storage and disposal of pesticides in Ontario. Ontario regulates pesticides by placing appropriate education, licensing and/or permit requirements on their use, under the *Pesticides Act* and Regulation 63/09. All pesticides must be used in accordance with requirements under the *Pesticides Act* and Regulation 63/09, which are available on the e-laws website at [ontario.ca/e-laws](http://ontario.ca/e-laws) or by calling ServiceOntario at 1-800-668-9938 or 416-326-5300.

### Classification of Pesticides

Before a federally registered pesticide can be sold or used in Ontario, it must be classified under the provincial *Pesticides Act*. The Ontario pesticide classification system consists of 12 classes. Ontario's Pesticides Advisory Committee (OPAC) is responsible for assessing new pesticide products and recommending to the MOECC the classification of these products. Pesticide products are classified on the basis of their toxicity, environmental and health hazard, persistence of the active ingredient or its metabolites, concentration, usage, federal class designation (e.g., domestic, commercial, restricted) and registration status. The provincial classification system provides the basis for regulating the distribution, availability and use of pesticide products in Ontario. Once approved by the MOECC, classified products are posted on the MOECC website at [ontario.ca/pesticides](http://ontario.ca/pesticides).

### Certification and Licensing

#### Certified Farmers and Their Assistants

Growers must be certified through the Grower Pesticide Safety Course in order to buy and use Class 2 and 3 pesticides on their farms. They do not require this certification to buy and use Class 4, 5, 6 or 7 pesticides, however, a grower needs to provide his/her Farm Business Registration Number or a signed "Farmer Self Declaration to Enable Purchase of a Class 4 Pesticide" form to the vendor when buying Class 4 pesticides. For information about certification for growers and training for assistants

to growers, visit the Ontario Pesticide Education Program website at [www.opep.ca](http://www.opep.ca) or call 1-800-652-8573.

## Class 12 Requirements for Growers

Starting on July 1, 2015, new requirements will be phased in for growers who plan to purchase or plant neonicotinoid-treated corn (silage or grain) or soybean seed in Ontario. For more information on the training and reporting requirements for growers, visit the MOECC website at [ontario.ca/pesticides](http://ontario.ca/pesticides), then click on “Neonicotinoid regulations.”

## Commercial Applicators (Exterminators) and Their Assisting Technicians

For more information about exterminator licensing and technician training, visit:

- the Ontario Pesticide Training and Certification website at [ontariopesticide.com](http://ontariopesticide.com) or call 1-888-620-9999 or 519-674-1575
- the Pesticide Industry Council’s Pesticide Technician Program website at [www.horttrades.com/pesticide-technician](http://www.horttrades.com/pesticide-technician) or call 1-800-265-5656 or e-mail [pic@hort-trades.com](mailto:pic@hort-trades.com)
- the Pesticide Industry Regulatory Council (PIRC) at [www.oipma.ca](http://www.oipma.ca)

## Exception Uses Under the Cosmetic Pesticide Ban

Pesticides listed in this publication are meant for Exception Uses (e.g., agriculture) under the Cosmetic Pesticide Ban unless the active ingredient is listed under Class 11 pesticides in Ontario Regulation 63/09.

For information about requirements under the *Pesticides Act* and Regulation 63/09, for golf courses and other excepted uses for turfgrass, including mandatory golf course IPM accreditation, go to [ontario.ca](http://ontario.ca) and search for:

- Pesticides and Golf Courses
- Specialty Turf and Specified Sports Fields

For more information about requirements in the *Pesticides Act* and Regulation 63/09 for the exception regarding the use of pesticides to maintain the health of trees, go to [ontario.ca](http://ontario.ca) and search for:

- Tree Care Specialists

For more information about pesticide regulations, certification and licensing, see:

- Inside front cover of this publication
- Pest Management Regulatory Agency (PMRA) website: [www.healthcanada.gc.ca/pmra](http://www.healthcanada.gc.ca/pmra)
- PMRA Pest Management Information Service: 1-800-267-6315 or TTY 1-800-465-7735 (from within Canada) or 1-613-736-3799 (from outside Canada)
- Ontario Ministry of the Environment and Climate Change (MOECC) website: [ontario.ca/pesticides](http://ontario.ca/pesticides)
- Regional MOECC Pesticides Specialist (See *Appendix C. Ministry of the Environment and Climate Change — Regional Contact Information*, on page 188.)
- Ministry of Agriculture, Food and Rural Affairs (OMAFRA) website: [ontario.ca/omafra](http://ontario.ca/omafra)
- Ontario Pesticide Education Program (University of Guelph, Ridgetown Campus) website: [www.opep.ca](http://www.opep.ca)
- Ontario Pesticide Training & Certification website: [www.ontariopesticide.com](http://www.ontariopesticide.com)
- Pesticide Industry Council’s Pesticide Technician Program website at [www.horttrades.com/pesticide-technician](http://www.horttrades.com/pesticide-technician)
- IPM Council of Canada website: [www.ontarioipm.com](http://www.ontarioipm.com) or [www.ipmcouncilcanada.org](http://www.ipmcouncilcanada.org)
- Pesticide Industry Regulatory Council (PIRC) at [www.oipma.ca](http://www.oipma.ca)

## Pesticide Application Information

When you decide to use a pesticide, choose the most appropriate formulation and application method for your situation. Use only properly calibrated sprayer equipment. Choose less toxic and less volatile alternatives when possible. Take all possible precautions to prevent the exposure of people and non-target organisms to the pesticide. Read the most current pesticide label thoroughly before application. The label provides important information, such as:

- directions for use (e.g., rates of application, crops/sites it can be used on, target pests, crop rotation restrictions, total number of applications, droplet size/nozzle type, application equipment, timing, appropriate weather conditions)
- required personal protective equipment (PPE)
- hazard symbols and warnings
- restricted entry intervals
- pre-harvest intervals
- buffer zones
- precautionary statements
- steps to be taken in case of an accident
- disposal

For more information on hazards, consult the Material Safety Data Sheet (MSDS) or contact the manufacturer.

For more information on pesticide application, see:

- Sprayers 101 at [www.sprayers101.com](http://www.sprayers101.com)
- OMAFRA Factsheet *Pesticide Drift from Ground Applications*
- Ontario Pesticide Education Program (University of Guelph, Ridgetown Campus) videos at [www.oep.ca/index.cfm/learning-resources/videos/](http://www.oep.ca/index.cfm/learning-resources/videos/)
- OMAFRA Agriculture and Agri-Food Canada booklet *Best Management Practices — Pesticide Storage, Handling and Application*, Order No. BMP13
- OMAFRA Factsheet *Pesticide Contamination of Farm Water Supplies — Recommendations on Avoidance, Clean-up and Responsibilities*

## Restricted Entry Intervals

Restricted Entry Interval (REI) is the period of time after a pesticide has been applied that agricultural workers or anyone else must not do hand labour tasks in treated areas. The REI allows the pesticide residues and vapours to dissipate to safe levels for work to be done.

An REI can range from 1 hr to several days. A pesticide label may state different REIs that are specific to a crop and post-application task (e.g., scouting, harvesting). If the REI is not stated on a label for agricultural crops, use a 12-hr REI. For golf courses and residential turf applications, the spray solution must be dry before entry can occur.

Hand labour tasks involve substantial worker contact with treated surfaces such as plants, plant parts or soil. Examples of these activities include planting, harvesting, pruning, detasseling, thinning, weeding, scouting, topping, sucker removal, mowing, roguing and packing produce into containers in the field or greenhouse. You can only do these tasks after the REI has passed. Hand labour generally does not include operating, moving or repairing irrigation or water equipment, except for hand-set irrigation.

A Certified Farmer or Licensed Commercial Applicator (i.e., a holder of the appropriate Exterminator License, such as an Agriculture Exterminator Licence or a Greenhouse/Interior Plant Exterminator Licence) may need to re-enter a treated area to do short-term tasks before the end of the REI. In these cases, the Certified Farmer or Licensed Commercial Applicator may re-enter 4 hr after the application wearing a NIOSH-approved respirator and any other protective clothing (PC) and the personal protective equipment stated on the label for mixing and loading. This Certified Farmer or Licensed Commercial Applicator (exterminator) must not be in the treated area during the REI for more than a total of 1 hr in any 24-hr period.

See Figure 8–1, page 158, for an example of a 24-hr REI on a pesticide label.

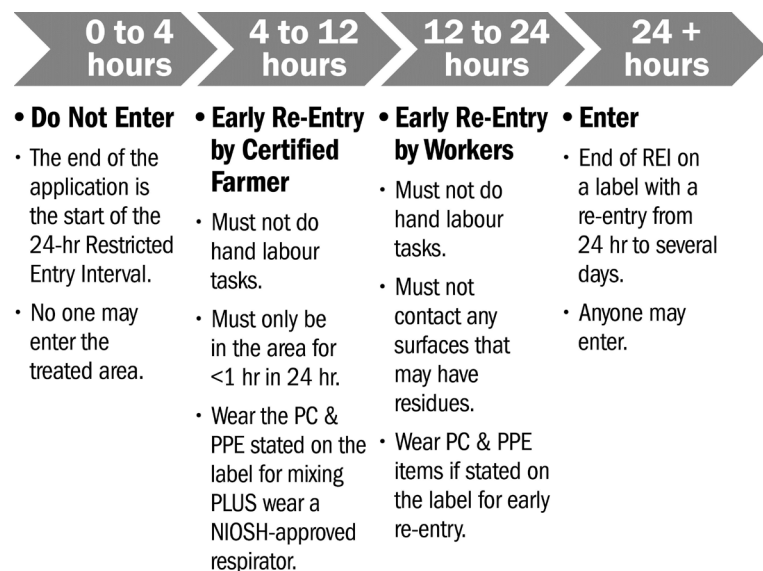


**Figure 8–1.** Example of a 24-hr REI on a pesticide label.

Certified Farmers and Licensed Commercial Applicators should plan pesticide applications around work tasks so that no one needs to re-enter treated areas before the restricted entry interval has passed.

## Days to Harvest Intervals for Food Crops (Pre-harvest, Pre-grazing and Feeding Intervals)

These intervals state the minimum time that must pass between the last pesticide application and the harvesting of the crop or the grazing and cutting of the crop for livestock feed. If you harvest a crop before the pre-harvest interval (PHI) has passed, there may be pesticide residues in excess of the maximum residue limits (MRLs) set by PMRA.

“Up to the day of harvest” means the same as 0 days PHI; however, the REI may be more restrictive (e.g., a 12-hr restricted entry interval) and must be observed for harvesting that occurs on the day of pesticide application.

**To avoid exceeding the maximum residue limits, always follow the directions on the label.**

## Buffer Zones

Buffer zones, or no-spray areas, are areas left untreated to protect an adjacent sensitive area, such as sensitive terrestrial and aquatic habitats. Generally, a buffer zone is the downwind distance separating the point of direct pesticide application from the nearest boundary of a sensitive habitat. For soil fumigation, a buffer zone is an area established around the perimeter of each application block.

Leave a suitable buffer zone between the treatment area and adjacent sensitive area. Buffer zones may vary depending on the method of application (e.g., aerial, field boom, air blast). Check the pesticide labels for buffer zone requirements.

**Sensitive terrestrial habitats** include hedgerows, grasslands, shelterbelts, windbreaks, forested areas and woodlots.

**Sensitive freshwater habitats** include lakes, rivers, streams, creeks, reservoirs, marshes, wetlands and ponds.

Health Canada’s PMRA has an online spray drift calculator that allows applicators to modify the buffer zones specified on the product label based on weather conditions, the category of the spray equipment and the droplet size. For more information, see the Buffer Zone Calculator at [www.hc-sc.gc.ca/cps-spc/pest/agri-commerce/drift-derive/calculator-calculatrice-eng.php](http://www.hc-sc.gc.ca/cps-spc/pest/agri-commerce/drift-derive/calculator-calculatrice-eng.php).

### Setback Distances for Water Bodies

It is an offence under the federal *Fisheries Act* to introduce into water any material that may be harmful to fish or fish habitat, and under the *Species at Risk Act*, to impact endangered or threatened fishes and fresh water mussels. To protect these waters, applicators must determine a suitable setback distance between the area to be protected and the area where pesticide treatments are planned (if the setback distance is not specified on the pesticide label). The protected area includes the water body as well as adjacent riparian (riverbank) areas that contribute to fish food and habitat.

## Protect the Environment

### Protect Water Sources

According to the British Crop Protection Council (BCPC), 40%–70% of surface water pesticide contamination comes from mixing and filling areas.

Where possible, load or mix pesticides on impermeable surfaces located safely away from watercourses or environmentally sensitive areas. Collect drainage and run-off and dispose of it safely (*Your Guide to Using Pesticides*, BCPC 2007).

Clean your spray equipment away from wells, ponds, streams and ditches. Apply the diluted rinse water (usually at a ratio of 10:1) to the treatment area (crop), but do not exceed the pesticide rate recommended on the label.

Do not make a direct connection between any water supply (e.g., public supply, wells, watercourse or pond) and a spray tank. Use an anti-backflow device or intermediate system to prevent back-siphoning that could contaminate the water supply.

Immediately contain and clean up any spills to prevent contamination to water sources.

Check the pesticide label for specific instructions on protection of water sources.

For more information on protecting water sources, see [ontario.ca/crops](http://ontario.ca/crops):

- OMAFRA Factsheet *Pesticide Contamination of Farm Water Supplies — Recommendations on Avoidance, Cleanup and Responsibilities*
- OMAFRA Factsheet *Groundwater — An Important Rural Resource: Protecting the Quality of Groundwater Supplies*
- OMAFRA Agriculture and Agri-Food Canada booklet *Best Management Practices — Pesticide Storage, Handling and Application*, Order No. BMP13

### Bee Poisoning

Honeybees, native bee species and other pollinating insects are important pollinators for many Ontario crops. Insecticides, some of which may negatively affect bees, require careful management to achieve both pollination and insect control. Growers and licensed commercial applicators can protect bees by following these suggestions:

- Time insecticide applications to minimize bee exposure (e.g., apply post bloom). Daytime treatments, when bees are foraging, are most hazardous. Insecticide applications in the evening are the safest, unless there is evidence of a strong temperature inversion or high humidity. Under normal circumstances, spraying after 8 PM allows the spray to dry before the bees are exposed to it the next day. Spraying during early morning is the next best time, when fewer bees are foraging, but pesticide residues may still be present. Spraying should be completed well before 7 AM. While honeybees and most other pollinating insects do not usually forage at temperatures below 13°C, bumblebees do. If you plan to spray in the morning, contact beekeepers who have bees within 5 km of your crop and spray site. The beekeepers may then have the option of taking any possible protective action.
- Do not apply insecticides while fruit trees are in bloom. The *Bees Act* makes it an offence to do so in Ontario. Do not spray any flowering crop on which bees are foraging.
- To prevent drift toward nearby hives, do not apply insecticides on windy days or when there is evidence of a strong temperature inversion.
- Bees and other pollinators may be poisoned by visiting flowering weeds, trees and cover crops that have come into contact with an insecticide via spray drift or drift of insecticide-contaminated dust during planting. Avoid spray drift to flowering weeds that are adjacent to or within the target field. Where possible, mow down flowering cover crops or flowering weeds in and bordering target fields prior to spraying to help safeguard the bees. Control dandelions and other flowering weeds within fields before spraying or planting seeds treated with an insecticide. Take measures to reduce movement of dust from insecticide seed treatments to flowering trees, weeds and water sources that are in or adjacent to the target field. For more information on reducing dust movement, see PMRA's *Pollinator Protection and Responsible Use of Treated Seed — Best*

*Management Practices* at [www.hc-sc.gc.ca/cps-spc/pubs/pest/\\_fact-fiche/pollinator-protection-pollinisateurs/treated\\_seed-semences\\_traitees-eng.php](http://www.hc-sc.gc.ca/cps-spc/pubs/pest/_fact-fiche/pollinator-protection-pollinisateurs/treated_seed-semences_traitees-eng.php).

- Systemic insecticides may also pose a high risk to bees and other insect pollinators. Bees can be exposed to insecticide residues in or on flowers, leaves, pollen, nectar and/or surface water. Do not apply insecticide or allow it to drift onto blooming crops or off-site habitat if bees are foraging in or adjacent to the treatment area.
- Beekeepers should remove honeybee colonies as soon as pollination is complete in the crop and before any insecticides are applied post bloom. If the colonies cannot be removed in time, beekeepers can place burlap or cloth soaked in water at the entrance of the hive to disrupt the flight of the bees for up to 12 hr and provide more time for spray to dry. To help prevent overheating of the hive during this time, keep an opening of 2.5 cm on each side of the hive entrance so bees can still get out and ventilate the hive. Also, the water on the burlap or cloth will help cool the colony.
- If there is a risk of honeybee poisoning, try to choose an insecticide that is not highly toxic to bees. When there is a choice, choose a product formulation that is less hazardous to bees.
- Always read the most current label for guidance.
- Before applying a pesticide or planting with insecticide-treated seed, advise local beekeepers so they can move colonies out of the danger area, if this is an option.

## Manage Drift

Pesticide drift is the aerial movement and unintentional deposit of pesticide outside the target area. Drift results in wasted product and may compromise crop protection and also may adversely affect nearby sensitive environmental areas, crops and wildlife. The following strategies can help reduce the risk of pesticide drift:

- Do not spray when wind speeds are high or gusty. These conditions increase the potential for spray and vapour drift. Check pesticide labels for allowable wind speeds for spraying. However, not all labels provide this specific information.

- Constantly monitor wind conditions during spraying using a good-quality wind meter. Record the wind speed and direction. As wind conditions change, you may need to make adjustments to further reduce the drift potential, such as increasing water volume, minimizing nozzle-to-target distance, changing nozzle technology, changing fields because of surrounding influences or stopping spraying until conditions improve.
- Do not spray during periods of dead calm. Periods of dead calm may occur in early morning or late evening, at which time the temperature is usually cooler and the relative humidity is typically higher, which can result in the spray droplets remaining aloft, like fog. When the wind picks up, these spray droplets can move away from the target area, possibly causing injury to adjacent non-target areas. Off-target drift in calm conditions can occur hours after the spray event was completed.

Temperature inversions create problems for spray applicators because pesticide spray can:

- stay concentrated for long periods over the target
- move with the cool air over considerable distances when the breeze picks up
- move down slopes and concentrate in low-lying regions
- drift unpredictably as the inversion dissipates during the morning

Field air temperatures are often very different from local or regional forecasts, so the most reliable method of detecting inversion conditions is to measure temperatures at, and several metres above, the ground. Spray applicators can recognize a temperature inversion when:

- there is a big difference between the daytime and nighttime temperatures
- early evening and nighttime wind speeds are considerably less than during the day
- sounds seem to carry farther
- odours seem more intense
- daytime cumulus clouds collapse toward evening
- overnight cloud cover is 25% or less
- mist, fog, dew or frost occur
- smoke or dust hangs in the air and/or moves laterally in a sheet

Temperature inversions start to form 3 hr prior to sunset, become stronger as the sun sets and continue until sunrise when the surface warms and air mixing begins. **If you suspect there's an inversion, don't spray. Often, warnings for the risk of inversions are stated right on the product label.**

- Use the sprayer output specified on the pesticide label.
- Use a nozzle that will produce the droplet size specified on the pesticide label or delivers droplets appropriate for the job. Nozzles that produce fine droplets are rarely, if ever, required.
- Where practical, use air induction nozzles, which significantly reduce drift compared to conventional nozzles.
- Check the height of the boom to the target or distance from airblast boom to the target. Minimize the distance as much as possible while still maintaining spray uniformity.
- Establish buffer zones for the protection of adjacent sensitive areas. Some pesticide labels will state buffer zone setbacks; follow these carefully.
- Use spray plume protection where practical or available (hoods, shrouds, screens or air curtains).
- Use drift-reducing adjuvants in the spray tank as directed on the label. Mechanical or hydraulic agitations have been shown to reduce the effectiveness of certain drift-reducing adjuvants. Be aware that certain combinations of anti-drift adjuvants and air-induction nozzles have been shown to increase the incidence of fine droplets that will drift.
- When possible, use non-volatile pesticide formulations or products.

For more information about spray drift, see:

- Sprayers 101: [www.sprayers101.com](http://www.sprayers101.com)
- OMAFRA website: [ontario.ca/spraydrift](http://ontario.ca/spraydrift)
- OMAFRA Factsheet *Pesticide Drift from Ground Applications*
- OMAFRA Agriculture and Agri-Food Canada booklet *Best Management Practices — Pesticide Storage, Handling and Application*, Order No. BMP13
- Ontario Pesticide Education Program (University of Guelph, Ridgetown Campus) videos *How to Manage Spray Drift* and *Spray Drift Reduction Through Air Induction*, available at [www.opep.ca/index.cfm/learning-resources/videos/chapter-18-drift-of-pesticides/](http://www.opep.ca/index.cfm/learning-resources/videos/chapter-18-drift-of-pesticides/)

## Waste Management (container disposal)

### Empty Pesticide Containers Up to 23 L

Never re-use empty containers.

The Ontario Empty Pesticide Container Recycling Program, an industry-led program, is available free of charge to growers and commercial applicators. Through this program, you can return triple-rinsed or pressure-rinsed plastic pesticide and fertilizer containers up to 23 L to container collection depots located throughout the province. Remove the cap and booklet from the pesticide container before recycling. To locate the closest container collection depot, visit [www.cleanfarms.ca](http://www.cleanfarms.ca), call your local dealer or contact CleanFARMS at 416-622-4460 (toll-free at 1-877-622-4460) or [info@cleanfarms.ca](mailto:info@cleanfarms.ca).

### Empty Pesticide Containers Greater Than 23 L

Growers and commercial applicators should return pesticide containers that are greater than 23 L in size to the point of sale or to the manufacturer for disposal. Contact your local dealer for details on disposal of these containers, or contact CleanFARMS at 416-622-4460 (toll-free at 1-877-622-4460) or [info@cleanfarms.ca](mailto:info@cleanfarms.ca).

### Empty Seed and Pesticide Bags

Growers can return their empty seed and pesticide bags to select retail locations. Contact your local dealer for details on disposal of these empty seed and pesticide bags, or contact CleanFARMS at 416-622-4460 (toll-free at 1-877-622-4460) or [info@cleanfarms.ca](mailto:info@cleanfarms.ca).

### Surplus Spray Mix

The best approach is to plan the spray job accurately to avoid creating a surplus.

When this is unavoidable, dispose of excess spray mix by spraying it on other crops that require an application of this pesticide. Before spraying, check the label to make sure the pesticide is registered for use on that other crop.

If you cannot find another allowable crop to spray, then dilute the remaining spray mix by adding 10 parts of water for each 1 part of spray mix. The diluted solution can be safely applied to the original treated area as long as you do not exceed the pesticide rate recommended on the label. Be sure to check the label for any restrictions about crop rotation, days to harvest or disposal of surplus spray mix.

Never re-spray the treated field with undiluted spray mix. Spraying an area twice at the same pesticide rate will double the labeled pesticide rate. This may cause illegal pesticide residues in the harvested crop or harmful residues in the soil that can cause crop damage.

### Surplus Pesticide Disposal

Be sure to safely dispose of pesticides that you do not need or cannot use. Options for proper disposal include:

- Contact the supplier. It is sometimes possible to return unused pesticide if it is still in its original, unopened container.
- Hire a waste hauler who is licensed under Part V of the *Environmental Protection Act* to carry hazardous wastes. Look in the Yellow Pages of your telephone directory under Liquid Waste Removal.
- CleanFARMS operates a free Obsolete Pesticide Collection Program throughout the province every three years. To locate the closest collection point and date, visit the CleanFARMS website ([www.cleanfarms.ca](http://www.cleanfarms.ca)), contact CleanFARMS at 416-622-4460 (toll free at 877-622-4460) or [info@cleanfarms.ca](mailto:info@cleanfarms.ca) or contact your local dealer for program details.
- Contact your municipality to see if any waste collection days are scheduled and verify whether quantities of agricultural pesticides will be accepted.

### Storing Pesticides

Ontario's *Pesticides Act* and Regulation 63/09 provide details on storage requirements for pesticide storage facilities. As shown in Table 8–1, the storage requirements that must be followed are dependent on which classes of pesticides you store.

**Table 8–1.** Requirements for Farm Pesticide Storage Facilities

| Storage requirements                                                  | Pesticide Classes |         |                   |
|-----------------------------------------------------------------------|-------------------|---------|-------------------|
|                                                                       | Class 2           | Class 3 | Class 4, 5, 6 & 7 |
| No contact with food or drink                                         | YES               | YES     | YES               |
| Not an impairment to health and safety                                | YES               | YES     | YES               |
| Clean and orderly                                                     | YES               | YES     | YES               |
| Warning sign G posted*                                                | YES               | YES     | YES               |
| Emergency telephone numbers posted**                                  | YES               | YES     | YES               |
| Vented to outside                                                     | YES               | YES     | NO                |
| Limited access (locked)                                               | YES               | YES     | NO                |
| No floor drain                                                        | YES               | YES     | NO                |
| Respiratory protection and protective clothing kept readily available | YES               | YES     | NO                |
| Area used primarily for pesticides                                    | YES               | NO      | NO                |

**Note:** Sufficient precautions are needed in your storage area to prevent the pesticide from entering the natural environment. Ensure your floor drain does not enter the natural environment.

\* See [ontario.ca](http://ontario.ca) for requirements for warning sign G (Search for sample warning signs for pesticide use). These signs can be purchased from your pesticide dealer/vendor.

\*\* Emergency contact numbers must include telephone numbers for the local fire department, hospital and poison control centre. The number for the MOECC Spills Action Centre (1-800-268-6060) should also be readily available.

For more information about storing pesticides, see:

- OMAFRA Factsheet *Farm Pesticide Storage Facility*
- OMAFRA Agriculture and Agri-Food Canada booklet *Best Management Practices — Pesticide Storage, Handling and Application*, Order No. BMP13
- Ontario Pesticide Education Program (University of Guelph, Ridgetown Campus) *Grower Pesticide Safety Course Manual*, available at [www.opep.ca](http://www.opep.ca). Select “Learning.”

## Pesticide Spills

If a pesticide spill causes, or is likely to cause, an adverse effect that is greater than that which would result from the proper use of the pesticide, you must notify the Ministry of the Environment and Climate Change Spills Action Centre at 1-800-268-6060 (24 hr a day, 7 days a week) and your municipality.

A spill is defined as a discharge of pollutant that is abnormal in quality or quantity, from or out of a structure, vehicle or other container into the environment. An incident such as an overturned pesticide sprayer that results in the loss of the spray solution to the environment is an example of a spill. A pesticide container that ruptures and leaks its contents is another example of a spill. The discharge or spraying of a pesticide in an unapproved area is also considered a spill.

Before you begin to clean up a spill of any nature, remember to protect yourself against pesticide exposure. Wear the proper protective clothing and personal protective equipment. If the spill occurs inside an enclosed area (e.g., a pesticide storage area or a vehicle during transport), ventilate the area first. Once you have protected yourself and removed other persons or animals from the spill site, take additional measures to stop the spill at the source and prevent it from spreading and/or contaminating watercourses. Specific precautions, emergency contact information and first aid procedures may be found on the label.

For minor spills, it may be possible to rectify the problem:

- **For a liquid spill** — Cover the spill with a thick layer of absorbent material such as kitty litter, vermiculite or dry soil. Sweep or shovel the material into a waste drum and dispose of the contents as you would a hazardous waste.
- **For a dust, granular or powder spill** — Sweep or shovel the material into a waste drum and dispose of the contents as you would a hazardous waste.

For major spills, it is essential to stop the spill from spreading.

The clean-up guidelines above may not be appropriate for all spill situations. Once you have contained the spill, follow directions from the manufacturer and regulatory authorities on cleaning the contaminated area.

Some of the information contained in this chapter is not authoritative. It is derived from the *Pesticides Act*, Ontario Regulation 63/09 and the federal *Pest Control Products Act*, *Fisheries Act* and *Species at Risk Act* and is for informational purposes only. Efforts have been made to make it as accurate as possible, but in the event of a conflict, inconsistency or error, the requirements set out in the referenced legislation take precedence. For specific legal details, please visit [ontario.ca/laws](http://ontario.ca/laws) (for Ontario legislation) and [www.laws.justice.gc.ca](http://www.laws.justice.gc.ca) (for federal legislation) and consult your lawyer if you have questions about your legal obligations.

For information on preventing spills, see:

- OMAFRA Factsheet *Ways to Avoid Pesticide Spills*
- OMAFRA Agriculture and Agri-Food Canada booklet *Best Management Practices — Pesticide Storage, Handling and Application*, Order No. BMP13
- Ontario Pesticide Education Program (University of Guelph, Ridgetown Campus) *Grower Pesticide Safety Course Manual*, available at [www.opep.ca](http://www.opep.ca). Select “Learning.”

**For pesticide poisonings and pesticide injuries, call:**

**Poison Information Centre: 1-800-268-9017  
(TTY) 1-877-750-2233**

**For more information, see Emergency and First Aid Procedures for Pesticide Poisoning on inside back cover.**



## 9. Pesticides Used on Field Crops in Ontario

**Table 9-1.** Seed Treatments Used on Field Crops — Fungicides

| <b>LEGEND:</b> F = Flowable FS = Flowable Concentrate LS = Liquid Suspension LOS = Live Organism Suspension P = Powder |                                         |                                |                                                  |                    |                                                                                                                                                                                                                                                  |                                         |
|------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|--------------------------------|--------------------------------------------------|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|
| <b>TRADE NAME</b>                                                                                                      | <b>Active Ingredient</b>                | <b>Chemical Family</b>         | <b>Risk of Resistance Developing<sup>1</sup></b> | <b>Formulation</b> | <b>Crops</b>                                                                                                                                                                                                                                     | <b>Manufacturer</b>                     |
| <b>Fungicides</b>                                                                                                      |                                         |                                |                                                  |                    |                                                                                                                                                                                                                                                  |                                         |
| Agrox FL                                                                                                               | captan                                  | phthalimide                    | low                                              | F                  | corn, soybeans                                                                                                                                                                                                                                   | Norac Concepts Inc.                     |
| Allegiance FL                                                                                                          | metalaxyl                               | acylamine                      | medium                                           | F                  | canola, cereals, corn, forages, soybeans                                                                                                                                                                                                         | Bayer CropScience                       |
| Anchor                                                                                                                 | carbathiin + thiram                     | anilide + dithiocarbamates     | low                                              | F (DB)             | soybeans                                                                                                                                                                                                                                         | MacDermid Agricultural Solutions Canada |
| Apron FL                                                                                                               | metalaxyl                               | acylamine                      | medium                                           | F                  | canola, cereals, corn, forages, soybeans                                                                                                                                                                                                         | Bayer CropScience                       |
| Apron Maxx RFC                                                                                                         | fludioxonil + metalaxyl-M               | phenylpyrrole + acylamine      | low to medium                                    | F                  | dry edible beans, soybeans                                                                                                                                                                                                                       | Syngenta Canada Inc.                    |
| Apron Maxx RTA                                                                                                         | fludioxonil + metalaxyl-M               | phenylpyrrole + acylamine      | low to medium                                    | F                  | dry edible beans, soybeans                                                                                                                                                                                                                       | Syngenta Canada Inc.                    |
| Apron XL LS                                                                                                            | metalaxyl-M                             | acylamine                      | medium                                           | LS                 | canola, corn, dry edible beans, forages, soybeans, wheat                                                                                                                                                                                         | Syngenta Canada Inc.                    |
| Clariva pn                                                                                                             | <i>Pasteuria nishizawae</i>             | biological                     | low                                              | LOS                | soybean                                                                                                                                                                                                                                          | Syngenta Canada Inc.                    |
| Dividend XL RTA                                                                                                        | difenoconazole + metalaxyl-M            | triazole + acylamine           | low to medium                                    | F                  | wheat                                                                                                                                                                                                                                            | Syngenta Canada Inc.                    |
| Dynasty 100FS                                                                                                          | azoxystrobin                            | strobilurin                    | low                                              | F                  | corn, dry edible beans                                                                                                                                                                                                                           | Syngenta Canada Inc.                    |
| EverGol Energy                                                                                                         | penflufen + prothioconazole + metalaxyl | anilide + triazole + acylamine | low to medium                                    | FS                 | wheat, barley, oats, soybeans, corn                                                                                                                                                                                                              | Bayer CropSciences                      |
| Gemini                                                                                                                 | triticonazole + thiram                  | triazole + dithiocarbamate     | low to medium                                    | F                  | barley, oat, wheat                                                                                                                                                                                                                               | BASF Canada                             |
| Heads Up Plant Protectant                                                                                              | saponins of <i>Chenopodium quinoa</i>   | plant based (not classified)   | low                                              | P                  | soybeans, dry beans                                                                                                                                                                                                                              | Heads Up Plant Protectants Inc.         |
| Intego Solo Fungicide                                                                                                  | ethaboxam                               | benzamides                     | low                                              | F                  | barley, buckwheat, pearl millet, proso millet, oats, rye, teosinte, triticale, wheat, corn (sweet and field), popcorn.<br>Crop Group 6: legume vegetables (succulent or dried except cowpea and field pea)<br>Crop Group 20a (rapeseed subgroup) | Valent Canada Inc.                      |
| Maxim 480 FS                                                                                                           | fludioxonil                             | phenylpyrrole                  | low                                              | F                  | corn, soybeans                                                                                                                                                                                                                                   | Syngenta Canada Inc.                    |

<sup>1</sup> Risk of resistance based on continuous use of product.

**Table 9–1. Seed Treatments Used on Field Crops — Fungicides**

| <b>LEGEND:</b> F = Flowable      FS = Flowable Concentrate      LS = Liquid Suspension      LOS = Live Organism Suspension      P = Powder |                                                                   |                                                                      |                                                  |                    |                                                                 |                                               |
|--------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|----------------------------------------------------------------------|--------------------------------------------------|--------------------|-----------------------------------------------------------------|-----------------------------------------------|
| <b>TRADE NAME</b>                                                                                                                          | <b>Active Ingredient</b>                                          | <b>Chemical Family</b>                                               | <b>Risk of Resistance Developing<sup>1</sup></b> | <b>Formulation</b> | <b>Crops</b>                                                    | <b>Manufacturer</b>                           |
| <b>Fungicides (cont'd)</b>                                                                                                                 |                                                                   |                                                                      |                                                  |                    |                                                                 |                                               |
| Maxim Quattro                                                                                                                              | thiabendazole<br>+ fludioxonil<br>+ metalaxyl-M<br>+ azoxystrobin | triazole<br>+ phenylpyrrole<br>+ acylamine<br>+ strobilurin          | low to medium                                    | F                  | corn                                                            | Syngenta Canada Inc.                          |
| Proseed                                                                                                                                    | fludioxonil                                                       | phenylpyrrole                                                        | low                                              | F                  | wheat                                                           | Syngenta Canada Inc.                          |
| Rancona Apex                                                                                                                               | ipconazole                                                        | triazole                                                             | medium                                           | F                  | barley, oat, rye, wheat                                         | MacDermid<br>Agricultural Solutions<br>Canada |
| Raxil MD                                                                                                                                   | tebuconazole<br>+ metalaxyl                                       | triazole<br>+ acylamine                                              | low to medium                                    | F                  | barley, oat, wheat                                              | Bayer CropScience                             |
| Raxil Pro MD                                                                                                                               | tebuconazole<br>+ prothioconazole<br>+ metalaxyl                  | triazole<br>+ triazole<br>+ acylamine                                | medium                                           | LS                 | wheat, barley, oats                                             | Bayer CropSciences                            |
| Raxil T                                                                                                                                    | tebuconazole                                                      | triazole                                                             | low to medium                                    | F                  | barley, oat, wheat                                              | Bayer CropScience                             |
| Thiram 75 WP                                                                                                                               | thiram                                                            | dithiocarbamates and<br>relatives                                    | low                                              | P                  | alfalfa                                                         | MacDermid<br>Agricultural Solutions<br>Canada |
| Trilex FL                                                                                                                                  | trifloxystrobin                                                   | strobilurin                                                          | high                                             | F                  | corn, dry edible beans, soybeans                                | Bayer CropScience                             |
| Vibrance XL                                                                                                                                | difenconazole<br>+ metalaxyl-M<br>+ sedaxane                      | triazole<br>+ acylamine<br>+ pyrazole-carboxamide                    | low to medium                                    | FS                 | barley, wheat, oats, rye                                        | Syngenta Canada Inc.                          |
| Vibrance Quattro                                                                                                                           | difenoconazole<br>+ metalaxyl-m<br>+ sedaxane<br>+ fludioxonil    | triazole<br>+ acylamine<br>+ pyrazole-carboxamide<br>+ phenylpyrrole | low to<br>moderate                               | FS                 | spring wheat, winter wheat, barley, oats, rye, triticale        | Syngenta Canada Inc.                          |
| Vitaflo 280                                                                                                                                | carbathiin<br>+ thiram                                            | anilide<br>+ dithiocarbamates                                        | low                                              | F                  | barley, corn, dry edible beans, flax, oat, rye, soybeans, wheat | MacDermid<br>Agricultural Solutions<br>Canada |
| Vitavax RS<br>Fungicide                                                                                                                    | carbathiin<br>+ thiram                                            | anilide<br>+ dithiocarbamates                                        | low                                              | F                  | canola, mustard, rapeseed                                       | Bayer CropScience                             |
| Vortex FL                                                                                                                                  | ipconazole                                                        | triazole                                                             | medium                                           | F                  | corn                                                            | Bayer CropScience                             |
| Votivo 240 FS                                                                                                                              | <i>Bacillus firmus</i><br>strain I-1582                           | biological                                                           | low                                              | LOS                | corn                                                            | Bayer CropScience                             |

<sup>1</sup> Risk of resistance based on continuous use of product.

**Table 9–2.** Nematocides Used in the Field**LEGEND:** LOS = Live Organism Suspension

| TRADE NAME         | Active Ingredient                    | Chemical Family | Risk of Resistance Developing | Formulation | Crops   | Manufacturer         |
|--------------------|--------------------------------------|-----------------|-------------------------------|-------------|---------|----------------------|
| <b>Nematocides</b> |                                      |                 |                               |             |         |                      |
| Clariva pn         | <i>Pasteuria nishizawae</i>          | biological      | low                           | LOS         | soybean | Syngenta Canada Inc. |
| Votivo 240 FS      | <i>Bacillus firmus</i> strain I-1582 | biological      | low                           | LOS         | corn    | Bayer CropScience    |

**Table 9–3. Seed Treatments Used on Field Crops — Fungicides with Insecticides**

| <b>LEGEND:</b> DB = Drill Box Application      F = Flowable      FS = Flowable Concentrate |                                                                                 |                                                                                          |                                                  |                    |                                                        |                      |
|--------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|------------------------------------------------------------------------------------------|--------------------------------------------------|--------------------|--------------------------------------------------------|----------------------|
| <b>TRADE NAME</b>                                                                          | <b>Active Ingredient</b>                                                        | <b>Chemical Family</b>                                                                   | <b>Risk of Resistance Developing<sup>1</sup></b> | <b>Formulation</b> | <b>Crops</b>                                           | <b>Manufacturer</b>  |
| <b>Fungicides with Insecticides</b>                                                        |                                                                                 |                                                                                          |                                                  |                    |                                                        |                      |
| Cruiser Maxx Beans                                                                         | thiamethoxam<br>+ metalaxyl-M<br>+ fludioxonil                                  | neonicotinoid<br>+ acylamine<br>+ phenylpyrrole                                          | low to medium                                    | F                  | dry edible beans, soybeans                             | Syngenta Canada Inc. |
| Cruiser Maxx Vibrance Beans                                                                | thiamethoxam<br>+ metalaxyl-M<br>+ fludioxonil<br>+ sedaxane                    | neonicotinoid<br>+ acylamine<br>+ phenylpyrrole<br>+ pyrazole-carboxamides               | low to medium                                    | FS                 | soybean                                                | Syngenta Canada Inc. |
| Gaucho CS                                                                                  | imidacloprid<br>+ carbathiin<br>+ thiram                                        | neonicotinoid<br>+ anilide<br>+ dithiocarbamates                                         | low to medium                                    | F                  | canola, mustard, rapeseed                              | Bayer CropScience    |
| Helix Vibrance                                                                             | thiamethoxam<br>+ difenconazole<br>+ metalaxyl-M<br>+ fludioxonil<br>+ sedaxane | neonicotinoid<br>+ triazole<br>+ acylamine<br>+ phenylpyrrole<br>+ pyrazole-carboxamides | low to medium                                    | FS                 | canola, rapeseed, mustard seed (condiment and oilseed) | Syngenta Canada Inc. |
| NipsIt SUITE Cereals OF                                                                    | clothianidin<br>+ metalaxyl<br>+ metconazole                                    | neonicotinoid<br>+ acylamine<br>+ triazole                                               | low to moderate                                  | F                  | wheat                                                  | Valent Canada Inc.   |
| NipsIt Suite Canola Seed Protection                                                        | clothianidin<br>+ metalaxyl<br>+ metconazole                                    | neonicotinoid<br>+ acylamine<br>+ triazole                                               | low to moderate                                  | F                  | canola                                                 | Valent Canada Inc.   |
| Prosper                                                                                    | clothianidin<br>+ carbathiin<br>+ thiram<br>+ metalaxyl                         | neonicotinoid<br>+ anilide<br>+ dithiocarbamates<br>+ acylamine                          | low to medium                                    | F                  | canola, rapeseed                                       | Bayer CropScience    |

<sup>1</sup> Risk of resistance based on continuous use of product.

**Table 9–4.** Seed Treatments Used on Field Crops — Insecticides

See Chapter 10 for neonicotinoid restrictions In Ontario.

**LEGEND:** F = Flowable FS = Flowable Concentrate

| TRADE NAME                    | Active Ingredient | Chemical Family | Risk of Resistance Developing <sup>1</sup> | Formulation | Crops                                                                                                                          | Manufacturer                                       |
|-------------------------------|-------------------|-----------------|--------------------------------------------|-------------|--------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|
| <b>Insecticides</b>           |                   |                 |                                            |             |                                                                                                                                |                                                    |
| Acceleron IX-409 <sup>2</sup> | imidacloprid      | neonicotinoid   | medium to high                             | F           | soybean                                                                                                                        | Bayer CropScience – Distributed by Monsanto Canada |
| Alias 240 SC                  | imidacloprid      | neonicotinoid   | medium to high                             | F           | wheat (durum, spring, winter), barley, oats<br>Use higher rates for fields with history of moderate to high wireworm pressure. | Adama Canada Limited                               |
| Cruiser 5FS                   | thiamethoxam      | neonicotinoid   | medium to high                             | F           | barley, corn, dry edible beans, soybeans, wheat                                                                                | Syngenta Canada Inc.                               |
| Cruiser 350FS                 | thiamethoxam      | neonicotinoid   | medium to high                             | F           | barley, dry edible beans, wheat                                                                                                | Syngenta Canada Inc.                               |
| Gaucho 480FL                  | imidacloprid      | neonicotinoid   | medium to high                             | F           | canola, seed corn only, mustard                                                                                                | Bayer CropScience                                  |
| Fortenza                      | cyantraniliprole  | diamide         | low to moderate                            | FS          | canola, mustard seed, rapeseed, oilseed mustard, including <i>B. carinata</i>                                                  | Syngenta Canada Inc.                               |
| Lumiderm                      | cyantraniliprole  | diamide         | low to medium                              | F           | canola                                                                                                                         | Dupont Canada                                      |
| NipsIt Inside 600             | clothianidin      | neonicotinoid   | medium to high                             | FS          | canola, rapeseed, carinata, wheat                                                                                              | Valent Canada Inc.                                 |
| Poncho 600FS                  | clothianidin      | neonicotinoid   | medium to high                             | FS          | canola, corn                                                                                                                   | Bayer CropScience                                  |
| Sombrero 600 FS               | imidacloprid      | neonicotinoid   | medium to high                             | FS          | canola, mustard, rapeseed, corn, cereals, soybeans                                                                             | Adama Canada Limited                               |
| Stress Shield 600             | Imidacloprid      | neonicotinoid   | medium to high                             | FS          | soybean, wheat, barley, oats, dry beans                                                                                        | Bayer CropScience                                  |

<sup>1</sup> Risk of resistance based on continuous use of product.<sup>2</sup> Acceleron and other branded seed treatments may contain more than one insecticide and/or fungicide therefore, refer to product label or contact distributor for future information.

**Table 9–5. Foliar Fungicides Used on Field Crops**

| <b>LEGEND: Relative toxicity:</b> High = Danger Poison Symbol      Moderate = Warning Poison Symbol      Low = Caution Poison Symbol |                              |                                     |                                                                                                                                        |                                  |                           |                        |                                                                                                                                                      |
|--------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|---------------------------|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>TRADE NAME</b>                                                                                                                    | <b>Active Ingredient</b>     | <b>Fungicide Classification</b>     | <b>Pre-Harvest Interval (days)</b>                                                                                                     | <b>Relative Acute Toxicities</b> | <b>Aerial Application</b> | <b>Manufacturer</b>    | <b>Use and Notes</b>                                                                                                                                 |
| Acapela                                                                                                                              | picoxystrobin                | strobilurin                         | corn: 7<br>soybeans: 14<br>wheat: See Note<br>oat: See Note<br>barley: See Note<br>rye: See Note<br>dry edible beans: 14<br>canola: 28 | low                              | yes, for all crops listed | DuPont Canada          | barley, corn, dry edible beans, oats, rye, soybeans, wheat, canola<br><br><b>Note:</b> PHI for grain is 45 days, forage is 7 days and hay is 14 days |
| Allegro                                                                                                                              | fluazinam                    | phenylpyridinylamine                | soybeans: 30                                                                                                                           | moderate                         | no                        | Syngenta Canada Inc.   | soybeans                                                                                                                                             |
| Astound                                                                                                                              | cyprodinil + fludioxonil     | aniline-pyrimidines + phenylpyrrole | 35                                                                                                                                     | low                              | yes                       | Syngenta Canada Inc.   | canola                                                                                                                                               |
| Blanket AP                                                                                                                           | azoxystrobin + propiconazole | strobilurin + triazole              | cereal: 45<br>barley: 45                                                                                                               | moderate                         | yes for all crops listed  | Adama Canada           | wheat, barley                                                                                                                                        |
| Bumper 418 EC                                                                                                                        | propiconazole                | triazole                            | canola: 60<br>cereals: 45<br>corn: 14<br>dry edible beans: 28                                                                          | moderate                         | yes, for all crops listed | Adama Canada           | barley, canola, corn, dry edible beans, oat, soybeans (for seed only), wheat<br><br>Moderately to highly toxic to aquatic organisms.                 |
| Caramba                                                                                                                              | metconazole                  | triazole                            | corn: 20<br>sweet corn hand: 18<br>sweet corn mechanical: 7<br>cereals: 30                                                             | low                              | yes, for all crops listed | BASF Canada            | barley, corn, oats, rye, soybeans, wheat                                                                                                             |
| Contans                                                                                                                              | <i>Coniothyrium minitans</i> | biological fungicide                | canola: 0<br>dry edible beans: 0<br>soybeans: 0                                                                                        | low                              | ground                    | Bayer CropScience      | canola, dry edible beans, soybeans                                                                                                                   |
| Cueva                                                                                                                                | copper octanoate             | multi-site contact (inorganic)      | dry edible beans: 1<br>soybeans: 1                                                                                                     | low                              | no                        | Neudorff North America | dry edible beans, soybeans                                                                                                                           |
| Dithane DG Rainshield                                                                                                                | mancozeb                     | dithiocarbamate                     | wheat: 40                                                                                                                              | low                              | yes, for all crops listed | Dow AgroSciences       | alfalfa (for seed only), spring and winter wheat<br><br>Toxic to fish.                                                                               |
| Folicur 250 EW                                                                                                                       | tebuconazole                 | triazole                            | barley: 36<br>oat: 36<br>soybeans: 20<br>wheat: 36                                                                                     | high                             | yes, for all crops listed | Bayer CropScience      | barley, oat, soybeans, wheat<br><br>Toxic to birds, small wild mammals, aquatic organisms and non-target plants.                                     |
| Folicur 432 F                                                                                                                        | tebuconazole                 | triazole                            | barley: 36<br>oat: 36<br>soybeans: 20<br>wheat: 36                                                                                     | high                             | yes, for all crops listed | Bayer CropScience      | barley, oat, soybeans, wheat<br><br>Toxic to birds, small wild mammals, aquatic organisms and non-target plants.                                     |

**Table 9-5. Foliar Fungicides Used on Field Crops**

| <b>LEGEND: Relative toxicity:</b> High = Danger Poison Symbol      Moderate = Warning Poison Symbol      Low = Caution Poison Symbol |                                |                                 |                                                                                                                                                     |                                  |                                       |                       |                                                                                                                                                 |
|--------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|---------------------------------------|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>TRADE NAME</b>                                                                                                                    | <b>Active Ingredient</b>       | <b>Fungicide Classification</b> | <b>Pre-Harvest Interval (days)</b>                                                                                                                  | <b>Relative Acute Toxicities</b> | <b>Aerial Application</b>             | <b>Manufacturer</b>   | <b>Use and Notes</b>                                                                                                                            |
| Fontelis                                                                                                                             | penthiopyrad                   | carboxamide                     | alfalfa: 14                                                                                                                                         | low                              | yes, for all crops listed             | Dupont Canada         | soybeans, alfalfa<br>Toxic to aquatic organisms.                                                                                                |
| Fullback 125 SC                                                                                                                      | flutriafol                     | piperazine                      | soybeans: 21                                                                                                                                        | low                              | no                                    | Cheminova Canada Inc. | Soybeans<br><b>Note:</b> Apply only to soybeans harvested for dry seed.<br>Toxic to aquatic organisms and non-target plants.                    |
| Headline EC                                                                                                                          | pyraclostrobin                 | strobilurin                     | corn: 7<br>dry edible beans: 7<br>oat: See Note<br>soybeans: 21<br>wheat: See Note                                                                  | high                             | yes, for all crops listed except corn | BASF Canada           | barley, corn, dry edible beans, oat, rye, soybeans, wheat<br><b>Note:</b> Do not apply to cereals after the boot stage (Zadok's 47 and beyond). |
| Lance WDG                                                                                                                            | boscalid                       | carboxamide                     | 21                                                                                                                                                  | high                             | yes, for all crops listed             | BASF Canada           | canola, dry edible beans                                                                                                                        |
| Overall 240 SC                                                                                                                       | iprodione                      | dicarboximide                   | 14                                                                                                                                                  | low                              | yes, for all crops listed             | Adama Canada          | canola                                                                                                                                          |
| Priaxor                                                                                                                              | pyraclostrobin + fluxapyroxad  | strobilurin + carboxamide       | sweet corn: 7<br>corn (field, seed, pop) 21<br>soybeans: 21<br>grasses: 14<br>canola: 21<br>dry bean: 30<br>cereals: no later than end of flowering | moderate                         | yes, for all crops listed             | BASF Canada           | barley, corn, rye, soybeans, wheat, bluegrasses, fescues, ryegrasses grown for seed, canola, dry beans, mustard                                 |
| Proline 480 SC                                                                                                                       | prothioconazole                | triazole                        | barley: 30<br>canola: 36<br>corn: 14<br>oat: 30<br>soybeans: 20<br>wheat: 30                                                                        | low                              | yes, for all crops listed             | Bayer CropScience     | barley, canola, corn (field and seed), oat, soybeans, wheat<br>Toxic to aquatic organisms and non-target terrestrial plants.                    |
| Propulse                                                                                                                             | fluopyram + prothioconazole    | benzamide-pyridine + triazole   | 14                                                                                                                                                  | low                              | ground                                | Bayer CropScience     | dry edible beans, chickpeas, lentils<br>Toxic to birds. Toxic to aquatic organisms.                                                             |
| Prosaro 250 EC                                                                                                                       | prothioconazole + tebuconazole | triazole                        | barley: 36 days<br>wheat: 36 days<br>oats: 36 days                                                                                                  | low                              | yes                                   | Bayer CropScience     | barley, wheat, oats<br>Toxic to birds, small wild mammals, aquatic organisms and non-target plants.                                             |
| Quadris                                                                                                                              | azoxystrobin                   | strobilurin                     | canola: 30<br>dry edible beans: 15<br>seed corn: 7<br>soybeans: 15                                                                                  | low                              | yes, for all crops                    | Syngenta Canada Inc.  | canola, seed corn, dry edible beans, soybeans<br>Toxic to aquatic organisms.                                                                    |

**Table 9–5. Foliar Fungicides Used on Field Crops**

| <b>LEGEND: Relative toxicity:</b> High = Danger Poison Symbol      Moderate = Warning Poison Symbol      Low = Caution Poison Symbol |                                    |                                 |                                                                                                                       |                                  |                                               |                      |                                                                                                                                                                                                                                           |
|--------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|---------------------------------|-----------------------------------------------------------------------------------------------------------------------|----------------------------------|-----------------------------------------------|----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>TRADE NAME</b>                                                                                                                    | <b>Active Ingredient</b>           | <b>Fungicide Classification</b> | <b>Pre-Harvest Interval (days)</b>                                                                                    | <b>Relative Acute Toxicities</b> | <b>Aerial Application</b>                     | <b>Manufacturer</b>  | <b>Use and Notes</b>                                                                                                                                                                                                                      |
| Quash                                                                                                                                | metconazole                        | triazole                        | canola 45 days<br>dry edible beans 21                                                                                 | low                              | yes                                           | Valent Canada Inc.   | canola, dry beans                                                                                                                                                                                                                         |
| Quilt                                                                                                                                | azoxystrobin<br>+ propiconazole    | strobilurin<br>+ triazole       | barley: see Note<br>corn: 14<br>corn for silage: 30<br>dry edible beans: 30<br>soybeans: 30<br>wheat: see Note        | moderate                         | yes, for all crops listed                     | Syngenta Canada Inc. | barley, oat, soybeans, wheat<br><b>Note:</b> Do not apply to cereals after the boot stage (Zadok's 47 and beyond).<br>Toxic to aquatic organisms and non-target terrestrial plants.                                                       |
| Rovral WP                                                                                                                            | iprodione                          | dicarboximide                   | 14                                                                                                                    | low                              | yes, for all crops listed                     | Bayer CropScience    | canola, dry edible beans                                                                                                                                                                                                                  |
| Senator 70 WP                                                                                                                        | thiophanate-methyl                 | benzimidazole                   | 14                                                                                                                    | low                              | yes, for all crops listed                     | Engage Agro          | white beans                                                                                                                                                                                                                               |
| Serenade ASO                                                                                                                         | <i>Bacillus subtilis</i>           | biological fungicide            | canola: 0<br>dry edible beans: 0<br>soybeans: 0                                                                       | low                              | ground                                        | Bayer CropScience    | canola, dry edible beans, soybeans                                                                                                                                                                                                        |
| Stratego 250 EC                                                                                                                      | trifloxystrobin<br>+ propiconazole | strobilurin<br>+ triazole       | barley: see Note<br>oat: see Note<br>soybeans: 20<br>wheat: see Note                                                  | low                              | yes, for all crops listed except for soybeans | Bayer CropScience    | barley, oat, soybeans, wheat<br><b>Note:</b> Do not apply to cereals after the boot stage (Zadok's 47 and beyond).<br>Harmful to beneficial predatory or parasitic arthropods.                                                            |
| Tilt 250 E                                                                                                                           | propiconazole                      | triazole                        | canola: 60<br>cereals: 45<br>corn: 14<br>dry edible beans: 28<br>soybeans: 30                                         | low                              | yes, for all crops listed                     | Syngenta Canada Inc. | barley, canola, corn, dry edible beans, oat, soybeans, wheat<br>Toxic to aquatic organisms and non-target terrestrial plants. Toxic to fish.                                                                                              |
| Twinline                                                                                                                             | pyraclostrobin<br>+ metconazole    | strobilurin<br>+ triazole       | wheat: see Note<br>oats: see Note<br>rye: see Note<br>barley: see Note                                                | high                             | yes, for all crops listed                     | BASF Canada          | barley, rye, oats, wheat<br><b>Note:</b> Do not enter or allow worker entry into treated areas during the restricted-entry interval (REI) of 6 days.<br>Toxic to aquatic organisms, non-target terrestrial plants and small wild mammals. |
| Vertisan                                                                                                                             | penthiopyrad                       | carboxamide                     | corn: 7<br>soybeans: 14<br>wheat: see Note<br>barley: see Note<br>oat: see Note<br>dry edible beans: 21<br>canola: 21 | low                              | yes, for all crops listed                     | Dupont Canada        | <b>Note:</b> Do not apply to cereals after flowering (Feekes 10.5.1 and beyond).<br>Toxic to aquatic organisms.                                                                                                                           |

**Table 9–6. Foliar Insecticides Used on Field Crops**

| <b>LEGEND: Relative toxicity:</b> High = Danger Poison Symbol      Moderate = Warning Poison Symbol      Low = Caution Poison Symbol |                                   |                                   |                                                                                                                                 |                                  |                                       |                                  |                                                                                                                                                                                                                                                                                                       |
|--------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------|----------------------------------|---------------------------------------|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>TRADE NAME</b>                                                                                                                    | <b>Active ingredient</b>          | <b>Insecticide Classification</b> | <b>Pre-Harvest Interval</b>                                                                                                     | <b>Relative Acute Toxicities</b> | <b>Aerial Application</b>             | <b>Manufacturer</b>              | <b>Use and Notes</b>                                                                                                                                                                                                                                                                                  |
| Ambush 500EC                                                                                                                         | permethrin                        | pyrethroid                        | canola: 1<br>corn: 1                                                                                                            | low                              | yes                                   | Amvac Chemical Corporation       | Low mammalian toxicity. Very toxic to fish and bees.                                                                                                                                                                                                                                                  |
| Bioprotec CAF                                                                                                                        | <i>Bacillus thuringiensis</i>     | bacterial toxin                   | corn: 1                                                                                                                         | low                              | ground                                | United Agri Products Canada Inc. | field corn                                                                                                                                                                                                                                                                                            |
| Concept                                                                                                                              | imidacloprid + deltamethrin       | neonicotinoid + pyrethroid        | soybeans: 20                                                                                                                    | low                              | yes, for all crops listed             | Bayer CropSciences               | soybeans<br>Toxic to bees and fish.                                                                                                                                                                                                                                                                   |
| Coragen                                                                                                                              | chlorantraniliprole               | diamide                           | alfalfa: 0<br>dry edible beans: 1<br>field corn: 14<br>seed corn: 1<br>grass forages: 0<br>canola and mustard: 1<br>soybeans: 1 | low                              | yes, see Note.                        | DuPont Canada                    | alfalfa, dry edible beans, field and seed corn, grass forages (seed production only)<br><b>Note:</b> aerial application for field and seed corn, soybeans and dry edible beans; ground application for canola, alfalfa and grass forages<br>Toxic to certain beneficials. Toxic to aquatic organisms. |
| Cygon 480 EC                                                                                                                         | dimethoate                        | organophosphorus                  | alfalfa: 2<br>canola: 21<br>dry edible beans: 7<br>forages: 2<br>soybeans: 30                                                   | moderate                         | yes, for all crops listed             | Cheminova Canada                 | alfalfa, canola, dry edible beans, forages, soybeans<br>Toxic to bees. Moderately to highly toxic to aquatic organisms.                                                                                                                                                                               |
| Decis 5.0 EC                                                                                                                         | deltamethrin                      | pyrethroid                        | canola: 14<br>corn: 5                                                                                                           | high                             | yes, for all crops listed except corn | Bayer CropScience                | barley, canola, corn, mustard, oat, wheat<br>Toxic to bees for 1 day after application. Toxic to fish, aquatic organisms and beneficial insects.                                                                                                                                                      |
| Delegate WG                                                                                                                          | spinetoram                        | spinosyn                          | cereals: 21<br>soybeans: 28                                                                                                     | low                              | no                                    | Dow AgroSciences Canada          | barley, oat, rye, soybeans, wheat<br>Toxic to bees and certain beneficials.                                                                                                                                                                                                                           |
| Dipel 2X DF                                                                                                                          | <i>Bacillus thuringiensis</i>     | bacterial toxin                   | corn: 1                                                                                                                         | low                              | no                                    | Valent BioSciences               | corn, timothy                                                                                                                                                                                                                                                                                         |
| Endigo                                                                                                                               | thiamethoxam + lambda-cyhalothrin | neonicotinoid + pyrethroid        | soybeans: 30                                                                                                                    | high                             | yes, for all crops listed             | Syngenta Canada Inc.             | soybeans<br>Toxic to bees and certain beneficials.                                                                                                                                                                                                                                                    |
| Force 3.0G                                                                                                                           | tefluthrin                        | pyrethroid                        | Planting time only.                                                                                                             | moderate                         | no                                    | Syngenta Canada Inc.             | corn<br>Toxic to birds and small wild mammals. Toxic to aquatic organisms.                                                                                                                                                                                                                            |

**Table 9–6. Foliar Insecticides Used on Field Crops**

| <b>LEGEND: Relative toxicity:</b> High = Danger Poison Symbol      Moderate = Warning Poison Symbol      Low = Caution Poison Symbol |                          |                                        |                                                                                                              |                                  |                                                                                                  |                                  |                                                                                                                                |
|--------------------------------------------------------------------------------------------------------------------------------------|--------------------------|----------------------------------------|--------------------------------------------------------------------------------------------------------------|----------------------------------|--------------------------------------------------------------------------------------------------|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| <b>TRADE NAME</b>                                                                                                                    | <b>Active ingredient</b> | <b>Insecticide Classification</b>      | <b>Pre-Harvest Interval</b>                                                                                  | <b>Relative Acute Toxicities</b> | <b>Aerial Application</b>                                                                        | <b>Manufacturer</b>              | <b>Use and Notes</b>                                                                                                           |
| Imidan 50 WP                                                                                                                         | phosmet                  | organophosphorus                       | 7                                                                                                            | high                             | no                                                                                               | Gowan Company                    | alfalfa<br>Toxic to bees. Toxic to birds and small wild mammals. Toxic to aquatic organisms.                                   |
| Intrepid                                                                                                                             | methoxyfenozide          | diacylhydrazines                       | corn: 21 days<br>dry beans: 7 days                                                                           | low                              | no                                                                                               | Dow AgroSciences                 | Corn, dry edible beans<br>Toxic to aquatic organisms.                                                                          |
| Lagon 480 EC                                                                                                                         | dimethoate               | organophosphorus                       | alfalfa: 2<br>canola: 21<br>cereal: 2<br>dry edible beans: 7<br>soybeans: 30                                 | moderate                         | yes for all crops listed                                                                         | United Agri Products Canada Inc. | alfalfa, canola, cereals, dry edible beans, soybeans<br>Toxic to bees. Moderately to highly toxic to aquatic organisms.        |
| Lannate Toss-N-Go 90 SP                                                                                                              | methomyl                 | carbamate                              | canola: 8<br>cereals: 20                                                                                     | high                             | yes, for all crops listed                                                                        | DuPont Canada                    | canola, cereals<br>Toxic to bees.                                                                                              |
| Lorsban 4 E 15 G                                                                                                                     | chlorpyrifos             | organophosphorus                       | canola: 21<br>corn: 70<br>wheat: 60                                                                          | high                             | yes for all crops listed except corn                                                             | Dow AgroSciences                 | canola, cereals, corn<br>Toxic to bees, beneficials, birds and wildlife and extremely toxic to fish and aquatic organisms.     |
| Mako                                                                                                                                 | cypermethrin             | pyrethroid                             | barley: 45<br>canola: 30<br>corn: 5<br>wheat: 30                                                             | low                              | yes for corn and bertha armyworm in canola<br><br>no for wheat, barley and all other canola uses | Engage Agro                      | barley, canola, corn, wheat<br>Toxic to bees and other beneficial insects. Very toxic to fish and aquatic organisms.           |
| Malathion 500 EC                                                                                                                     | malathion                | organophosphorus                       | alfalfa: 7<br>cereals: 7<br>corn: 7<br>dry edible beans: 3                                                   | low                              | no                                                                                               | United Agri Products Canada      | alfalfa, cereals, corn, dry edible beans, soybeans<br>Toxic to bees and certain beneficial insects. Less effective below 20°C. |
| Matador 120 EC                                                                                                                       | lambda-cyhalothrin       | pyrethroid                             | canola: 7<br>field and seed corn: 21<br>silage corn: 14<br>dry edible beans: 14<br>soybeans: 14<br>wheat: 28 | high                             | yes, for all crops listed                                                                        | Syngenta Canada Inc.             | alfalfa, barley, canola, corn, dry edible beans, oat, soybeans, wheat<br>Toxic to bees.                                        |
| Movento                                                                                                                              | spirotetramat            | tetronic and tetramic acid derivatives | soybean: 21                                                                                                  | low                              | yes                                                                                              | Bayer CropScience                | soybean<br>Toxic to bee brood. Toxic to certain beneficial insects. Toxic to aquatic organisms.                                |

**Table 9–6. Foliar Insecticides Used on Field Crops**

| <b>LEGEND: Relative toxicity:</b> High = Danger Poison Symbol      Moderate = Warning Poison Symbol      Low = Caution Poison Symbol |                                          |                                   |                                                                                        |                                  |                                                     |                                  |                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-----------------------------------|----------------------------------------------------------------------------------------|----------------------------------|-----------------------------------------------------|----------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| <b>TRADE NAME</b>                                                                                                                    | <b>Active ingredient</b>                 | <b>Insecticide Classification</b> | <b>Pre-Harvest Interval</b>                                                            | <b>Relative Acute Toxicities</b> | <b>Aerial Application</b>                           | <b>Manufacturer</b>              | <b>Use and Notes</b>                                                                                                       |
| Oberon                                                                                                                               | spiromesifen                             | tetronic acids                    | field corn: 30<br>silage corn: 5                                                       | low                              | yes                                                 | Bayer CropScience                | corn (field and silage)<br>Toxic to bee brood. Toxic to certain beneficial insects.                                        |
| Pounce EC                                                                                                                            | permethrin                               | pyrethroid                        | canola: 1<br>corn: 1                                                                   | low                              | no                                                  | Bayer CropScience                | canola, cereals, corn, flax, sunflowers<br>Very toxic to bees.                                                             |
| Pyrifos 15G                                                                                                                          | chlorpyrifos                             | organophosphorus                  | Planting time only.                                                                    | low                              | no                                                  | United Agri Products Canada Inc. | corn<br>Toxic to bees, beneficials, birds and wildlife and extremely toxic to fish and aquatic organisms.                  |
| Pyrinex 480 EC                                                                                                                       | chlorpyrifos                             | organophosphorus                  | canola: 21<br>cereals: 60<br>corn: 70                                                  | low                              | yes, for all crops listed except corn               | United Agri Products Canada Inc. | canola, cereals, corn<br>Toxic to bees, beneficials, birds and wildlife and extremely toxic to fish and aquatic organisms. |
| Sevin XLR Plus                                                                                                                       | carbaryl                                 | carbamate                         | alfalfa: 2<br>barley: 28<br>corn: 1<br>dry edible beans: 5<br>oat: 14<br>wheat: 14     | moderate                         | yes, for all crops listed except beans and canola   | Bayer CropScience                | alfalfa, canola, cereals, corn, dry edible beans<br>Toxic to bees.                                                         |
| Silencer 120 EC                                                                                                                      | lambda-cyhalothrin                       | pyrethroid                        | barley: 28<br>canola: 7<br>corn: 14<br>dry edible beans: 14<br>oat: 28<br>soybeans: 21 | high                             | yes, for all crops listed except soybeans and beans | Adama Canada                     | pyrethroid<br>Toxic to bees.                                                                                               |
| Sivanto Prime                                                                                                                        | flupyradifurone                          | butenolides                       | soybean: 21<br>dry edible beans: 7<br>corn: 21                                         | low                              | yes                                                 | Bayer CropScience                | soybean, dry edible beans, corn<br>Toxic to bees and certain beneficial insects. Toxic to aquatic organisms.               |
| Thuricide HPC                                                                                                                        | <i>Bacillus thuringiensis</i>            | bacterial toxin                   | 0                                                                                      | low                              | yes                                                 | Valent Biosciences               | timothy                                                                                                                    |
| Transform WG                                                                                                                         | sulfoxaflor                              | sulfoximines                      | barley 14<br>wheat 14                                                                  | low                              | yes                                                 | Dow AgroSciences                 | barley, wheat, canola<br>Toxic to bees and certain beneficial insects.                                                     |
| Voliam Xpress                                                                                                                        | lambda-cyhalothrin + chlorantraniliprole | pyrethroid + diamide              | silage corn: 14<br>field and seed corn: 21                                             | high                             | yes, for all crops listed                           | Syngenta Canada Inc.             | field, seed and silage corn<br>Toxic to bees and certain beneficials.<br>Toxic to aquatic organisms.                       |

**Table 9–7.** Bt Corn Products/Traits Currently Available in Canada (as of April 2015)

Note that this table is revised more frequently than this publication. An up-to-date version can be found on the Canadian Corn Pest Coalition website at [www.cornpest.ca](http://www.cornpest.ca).

**LEGEND:** **Target Pests:** BCW = black cutworm CEW = corn earworm CRW = corn rootworm ECB = European corn borer FAW = fall armyworm WBC = western bean cutworm  
**Herbicide Tolerance:** GT = glyphosate tolerant LL = Liberty Link/glufosinate tolerant RR2 = Roundup Ready/glyphosate tolerant  
**Refuge:** IR = Integrated Refuge, where refuge hybrid seed has been pre-mixed with Bt hybrid seed in the bag

| Trade Name                                              | Transgenic Component                                  | Transgenic Events                       | Target Pests                 | Herbicide Tolerance <sup>1</sup> | Refuge % & Location                    | EU-Approved    |
|---------------------------------------------------------|-------------------------------------------------------|-----------------------------------------|------------------------------|----------------------------------|----------------------------------------|----------------|
| <b>Agrisure Products</b>                                |                                                       |                                         |                              |                                  |                                        |                |
| Agrisure CB/LL                                          | Cry1Ab                                                | Bt11                                    | ECB                          | LL                               | 20% — 400 m                            | Y              |
| Agrisure GT/CB/LL                                       | Cry1Ab                                                | Bt11, GA21                              | ECB                          | GT, LL                           | 20% — 400 m                            | Y              |
| Agrisure 3000GT                                         | Cry1Ab, mCry3A                                        | Bt11, GA21, MIR604                      | CRW, ECB                     | GT, LL                           | 20% — adjacent                         | Y              |
| Agrisure Viptera 3110                                   | Vip3A, Cry1Ab                                         | Bt11, GA21, MIR162                      | BCW, CEW, ECB, FAW, WBC      | GT, LL                           | 20% — 400 m                            | N <sup>2</sup> |
| Agrisure Viptera 3111                                   | Vip3A, Cry1Ab, mCry3A                                 | Bt11, GA21, MIR604, MIR162              | BCW, CEW, CRW, ECB, FAW, WBC | GT, LL                           | 20% — adjacent                         | N <sup>2</sup> |
| Agrisure Viptera 3220                                   | Cry1Ab, Vip3A, Cry1F                                  | Bt11, GA21, TC1507, MIR162              | BCW, CEW, ECB, FAW, WBC      | GT, LL                           | 5% IR                                  | N <sup>2</sup> |
| Agrisure 3122                                           | Cry1Ab, mCry3A, Cry1F, Cry34Ab1/Cry35Ab1              | Bt11, GA21, DAS-59122-7, MIR604, TC1507 | BCW, CRW, ECB, FAW, WBC      | GT, LL                           | 5% IR                                  | N <sup>2</sup> |
| <b>Genuity/SmartStax Products</b>                       |                                                       |                                         |                              |                                  |                                        |                |
| Genuity VT Double PRO (GENVT2P)                         | Cry1A.105, Cry2Ab2                                    | MON89034, NK603                         | CEW, ECB, FAW                | RR2                              | 5% — 400 m or 5% IR                    | Y              |
| Genuity VT Triple PRO (GENVT3P)                         | Cry1A.105, Cry2Ab2, Cry3Bb1                           | MON88017, MON89034                      | CEW, CRW, ECB, FAW           | RR2                              | 20% — adjacent or 10% IR               | Y              |
| Genuity SmartStax (GENSS) (Monsanto) or SmartStax (Dow) | Cry1A.105, Cry2Ab2, Cry1F, Cry3Bb1, Cry34Ab1/Cry35Ab1 | MON88017, MON89034, TC1507, DAS59122-7  | BCW, CEW, CRW, ECB, FAW, WBC | LL, RR2                          | 5% — adjacent (2-row minimum) or 5% IR | Y              |
| <b>Herculex Products</b>                                |                                                       |                                         |                              |                                  |                                        |                |
| Herculex 1 (HX1)                                        | Cry1F                                                 | TC1507                                  | BCW, ECB, FAW, WBC           | LL                               | 20% — 400 m                            | Y              |
| Herculex 1 (HX1) w RR2                                  | Cry1F                                                 | TC1507, NK603                           | BCW, ECB, FAW, WBC           | LL, RR2                          | 20% — 400 m                            | Y              |
| Herculex XTRA (HXX)                                     | Cry1F, Cry34Ab1/Cry35Ab1                              | TC1507, DAS59122-7                      | BCW, CRW, ECB, FAW, WBC      | LL                               | 20% — adjacent                         | Y              |
| Herculex XTRA (HXX) w RR2                               | Cry1F, Cry34Ab1/Cry35Ab1                              | TC1507, DAS59122-7, NK603               | BCW, CRW, ECB, FAW, WBC      | LL, RR2                          | 20% — adjacent                         | Y              |

<sup>1</sup> Herbicide tolerances listed are for the non-Integrated Refuge products. Integrated Refuge products may have different herbicide tolerances, and herbicide selection should be based on the properties of the refuge hybrid.

<sup>2</sup> Stack is not approved, but all single traits have approval in the EU.

Source: This table was modified from the original Handy Bt Traits Table by Chris DiFonzo (Michigan State University) and Eileen Cullen (University of Wisconsin-Madison). It was modified by Jocelyn Smith (University of Guelph, Ridgetown Campus) and Tracey Baute (OMAFRA) to include products available in Canada.

**Table 9–7. Bt Corn Products/Traits Currently Available in Canada (as of April 2015)**

Note that this table is revised more frequently than this publication. An up-to-date version can be found on the Canadian Corn Pest Coalition website at [www.cornpest.ca](http://www.cornpest.ca).

**LEGEND:** **Target Pests:** BCW = black cutworm CEW = corn earworm CRW = corn rootworm ECB = European corn borer FAW = fall armyworm WBC = western bean cutworm  
**Herbicide Tolerance:** GT = glyphosate tolerant LL = Liberty Link/glufosinate tolerant RR2 = Roundup Ready/glyphosate tolerant  
**Refuge:** IR = Integrated Refuge, where refuge hybrid seed has been pre-mixed with Bt hybrid seed in the bag

| Trade Name                          | Transgenic Component                         | Transgenic Events                            | Target Pests            | Herbicide Tolerance <sup>1</sup> | Refuge % & Location                                     | EU-Approved |
|-------------------------------------|----------------------------------------------|----------------------------------------------|-------------------------|----------------------------------|---------------------------------------------------------|-------------|
| <b>Optimum Products</b>             |                                              |                                              |                         |                                  |                                                         |             |
| Optimum Intrasect Insect Protection | Cry1F, Cry1Ab                                | NK603, TC1507, MON810                        | BCW, ECB, FAW, WBC      | LL, RR2                          | 5% — 400 m                                              | N           |
| Optimum AcreMax                     | Cry1F, Cry1Ab                                | NK603, TC1507, MON810                        | BCW, ECB, FAW, WBC      | LL, RR2                          | 5% IR                                                   | N           |
| Optimum Intrasect Xtra              | Cry1F, Cry 1Ab, Cry34Ab1/<br>Cry35Ab1        | NK603, TC1507, MON810,<br>DAS59122-7         | BCW, ECB, FAW, WBC, CRW | LL, RR2                          | 20% — adjacent                                          | N           |
| Optimum AcreMax XTreme              | Cry1F, Cry1Ab, Cry34Ab1/<br>Cry35Ab1, mCry3A | NK603, TC1507, MON810,<br>DAS59122-7, MIR604 | BCW, ECB, FAW, WBC, CRW | LL, RR2                          | 5% IR                                                   | N           |
| Optimum AcreMax Xtra                | Cry1F, Cry 1Ab, Cry34Ab1/<br>Cry35Ab1        | NK603, TC1507, MON810,<br>DAS59122-7         | BCW, ECB, FAW, WBC, CRW | LL, RR2                          | 10% IR                                                  | N           |
| <b>YieldGard Products</b>           |                                              |                                              |                         |                                  |                                                         |             |
| YieldGard CB (YGCB) w/RR2           | Cry1Ab                                       | MON810, NK603                                | ECB                     | RR2                              | 20% — 400 m                                             | Y           |
| YieldGard VT Triple (VT3)           | Cry1Ab, Cry3Bb1                              | MON88017, MON810                             | CRW, ECB                | RR2                              | 20% — adjacent                                          | Y           |
| <b>Bt Sweet Corn Products</b>       |                                              |                                              |                         |                                  |                                                         |             |
| Performance Series                  | Cry1A.105, Cry2Ab2,<br>Cry3Bb1               | MON88017, MON89034                           | CEW, CRW, ECB, FAW      | RR2                              | No refuge required if stubble destroyed within 30 days. | Y           |

<sup>1</sup> Herbicide tolerances listed are for the non-Integrated Refuge products. Integrated Refuge products may have different herbicide tolerances, and herbicide selection should be based on the properties of the refuge hybrid.

<sup>2</sup> Stack is not approved, but all single traits have approval in the EU.

Source: This table was modified from the original Handy Bt Traits Table by Chris DiFonzo (Michigan State University) and Eileen Cullen (University of Wisconsin-Madison). It was modified by Jocelyn Smith (University of Guelph, Ridgetown Campus) and Tracey Baute (OMAFRA) to include products available in Canada.

**Table 9–8.** Re-Entry Intervals for Pesticides Used on Field Crops

| Trade Name              | Active Ingredient                        | Re-Entry Interval                     |
|-------------------------|------------------------------------------|---------------------------------------|
| Acapela                 | picoxystrobin                            | 12 hr                                 |
| Ambush 500              | permethrin                               | when dry                              |
| Astound                 | cyprodinil + fludioxonil                 | 12 hr                                 |
| Blanket AP              | azoxystrobin + propiconazole             | 12 hr                                 |
| Caramba                 | metconazole                              | 5 days (cereals)<br>4 days (soybeans) |
| Concept                 | imidacloprid + deltamethrin              | 24 hr                                 |
| Coragen                 | chlorantraniliprole                      | 12 hr                                 |
| Decis 5.0 EC            | deltamethrin                             | 12 hr                                 |
| Delegate WG             | spinetoram                               | 12 hr                                 |
| Endigo                  | thiamethoxam + lambda-cyhalothrin        | 12 hr                                 |
| Folicur 250 EW          | tebuconazole                             | 12 hr                                 |
| Folicur 432 F           | tebuconazole                             | 12 hr                                 |
| Fontelis                | penthioapyrad                            | 12 hr                                 |
| Headline EC             | pyraclostrobin                           | 12 hr                                 |
| Imidan 50 WP            | phosmet                                  | 5 days for alfalfa                    |
| Intrepid                | methoxyfenozide                          | 12 hr                                 |
| Lance WDG               | boscalid                                 | 4 hr                                  |
| Lannate Toss-N-Go 90 SP | methomyl                                 | 24 hr                                 |
| Lorsban 4 E 15 G        | chlorpyrifos                             | 24 hr                                 |
| Matador 120 EC          | lambda-cyhalothrin                       | 24 hr                                 |
| Movento                 | spirotetramat                            | 12 hrs                                |
| Oberon                  | spiromesifen                             | 12 hr                                 |
| Overall 240 SC          | iprodione                                | 12 hr                                 |
| Pounce EC               | permethrin                               | when dry                              |
| Priaxor                 | pyraclostrobin                           | 12 hr                                 |
| Proline 480 SC          | prothioconazole                          | 24 hr                                 |
| Prosaro 250EC           | prothioconazole + tebuconazole           | 12 hr                                 |
| Pyrifos 15G             | chlorpyrifos                             | 24 hr                                 |
| Pyrinex 480 EC          | chlorpyrifos                             | 24 hr                                 |
| Quadris                 | azoxystrobin                             | when dry                              |
| Quilt                   | azoxystrobin + propiconazole             | 12 hr                                 |
| Rovral WP               | iprodione                                | 12 hr                                 |
| Silencer 120 EC         | lambda-cyhalothrin                       | 24 hr                                 |
| Stratego 250 EC         | trifloxystrobin + propiconazole          | 12 hr                                 |
| Transform WG            | sulfoxaflor                              | 12 hr                                 |
| Twinline                | pyraclostrobin + metconazole             | 6 days                                |
| Vertisan                | penthioapyrad                            | 12 hr                                 |
| Voliam Xpress           | lambda-cyhalothrin + chlorantraniliprole | 24 hr                                 |

**Table 9–9.** Pesticides Used in Field Crops That Affect Cholinesterase Levels in Blood

| Active Ingredient | Trade Name                                  |
|-------------------|---------------------------------------------|
| carbaryl          | Sevin XLR                                   |
| chlorpyrifos      | Lorsban 4E<br>Pyrinex 480 EC<br>Pyrifos 15G |
| dimethoate        | Cygon 480<br>Lagon 480                      |
| malathion         | Malathion 500 EC                            |
| methomyl          | Lannate Toss-N-Go                           |
| phosmet           | Imidan 50 WP                                |
| terbufos          | Counter                                     |

**Table 9–10.** High Toxicity of Insecticides to Honeybees

| Trade Name                                                                    | Active Ingredient                        |
|-------------------------------------------------------------------------------|------------------------------------------|
| <b>Group 1 – Very toxic. Do not apply to flowering crops or weeds.</b>        |                                          |
| Ambush 500EC<br>Pounce 384 EC                                                 | permethrin                               |
| Concept                                                                       | imidacloprid + deltamethrin              |
| Cygon 480 EC<br>Lagon 480 EC                                                  | dimethoate                               |
| Decis 5.0 EC                                                                  | deltamethrin                             |
| Delegate WG                                                                   | spinetoram                               |
| Endigo                                                                        | thiamethoxam + lambda-cyhalothrin        |
| Imidan 50 WP                                                                  | phosmet                                  |
| Lorsban 4E<br>Pyrifos 15G<br>Pyrinex 480 EC                                   | chlorpyrifos                             |
| Maka                                                                          | cypermethrin                             |
| Malathion 500 EC                                                              | malathion                                |
| Matador 120 EC<br>Silencer 120 EC                                             | lambda-cyhalothrin                       |
| Movento 240 EC                                                                | spirotetramat                            |
| Sevin XLR                                                                     | carbaryl                                 |
| Voliam Xpress                                                                 | lambda-cyhalothrin + chlorantraniliprole |
| <b>Group 2 – Apply only during late evening or early morning.<sup>1</sup></b> |                                          |
| Lannate Toss-N-Go                                                             | methomyl                                 |
| <b>Group 3 – Low toxicity</b>                                                 |                                          |
| Coragen                                                                       | chlorantraniliprole                      |
| Intrepid                                                                      | methoxyfenozide                          |
| Lumiderm                                                                      | cyantraniliprole                         |
| Oberon                                                                        | spiromesifen                             |

<sup>1</sup> Unusually low temperatures at time of application may cause insecticides to remain toxic up to 20 times longer than during warm weather. High temperatures in the early morning or late evening may extend active foraging by bees.



# 10. Neonicotinoid Regulations in Ontario

For up-to-date information, visit [ontario.ca/neonics](http://ontario.ca/neonics).

Ontario is taking action to strengthen pollinator health to ensure healthy ecosystems, a productive agricultural sector and a strong economy.

The Pollinator Health Strategy is multi-faceted, including:

- financial programs to assist beekeepers experiencing high levels of bee hive losses
- regulation limiting the use of neonicotinoid-treated corn and soybean seed
- the development of a comprehensive Pollinator Health Action Plan to address multiple stressors on pollinators

It builds on work already taken to improve pollinator health and sets out aspirational targets:

- an 80% reduction in the number of acres planted with neonicotinoid-treated corn and soybean seed by 2017
- an over-winter honeybee mortality rate of 15% by 2020

As part of the broader strategy to protect pollinators, the regulation under Ontario's *Pesticides Act* has been amended to require corn and soybean farmers and custom planters to demonstrate that they need to use Class 12 pesticides on a farm property before they can purchase and use them. The new regulation came into effect on July 1, 2015.

## Class 12 Pesticides

The provincial government is responsible for classifying pesticides and regulating their sale, use, transportation, storage and disposal.

Treated seeds are seeds that have been coated with a pesticide. The new regulatory requirements create a new class of pesticides — Class 12 — for corn and soybean seeds treated with the following neonicotinoid insecticides:

- imidacloprid
- thiamethoxam
- clothianidin

This new class of pesticides applies to corn seed grown for grain or silage and soybean seed.

The regulation does not apply to popping corn, sweet corn or corn used for the production of seed. Nor does it apply to soybean seed planted for the purpose of producing a soybean seed crop of certified status under contract. Corn seed and soybean seed treated only with fungicide are not classified as Class 12 pesticides under the regulation.

Farmers who will not be planting neonicotinoid-treated corn or soybean seed will not be subject to any new requirements under this regulation.

Farmers can only buy and use neonicotinoid-treated seeds that vendors have put on the "Class 12 Pesticides List." The list will be posted by August of each year at: [ontario.ca/page/class-12-pesticides](http://ontario.ca/page/class-12-pesticides).

The regulation does not include requirements for the transport and storage of Class 12 pesticides.

Farmers must use Class 12 pesticides in accordance with the directions set out on the label or tag by the federal government.

Certain requirements of the regulation to reduce the use of neonicotinoid-treated corn and soybean seed are being phased in over time.

## Important Regulation Timelines

**From August 31, 2015, to August 30, 2016**, in preparation for the 2016 planting season, farmers will have the option to take one of two courses of action to purchase and use neonicotinoid-treated corn and/or soybean seed, depending on the amount they intend on planting.

- As an incentive to achieve early reductions in the use of Class 12 pesticides, farmers can plant neonicotinoid-treated seeds on 50% or less of the total area of where they plant corn or soybeans on all farm properties and will not have to conduct a pest assessment. For more information on conducting a pest assessment visit [ontario.ca/document/pest-assessment-guide](http://ontario.ca/document/pest-assessment-guide).
- Farmers will need to complete and sign the Seed Amount Declaration form and provide it to the sales representative or seed vendor or to the custom seed treater. The Seed Amount Declaration form can be found on the Ontario Central Forms Repository at: [www.forms.ssb.gov.on.ca](http://www.forms.ssb.gov.on.ca). For more information see *Seed Amount Declaration*, below.
- Farmers who want to buy and plant Class 12 pesticides on more than 50% of the total area of their corn or soybean crop will need to complete a pest assessment report and provide it to the sales representative or seed vendor from whom they order seed or to the custom seed treater. Pest assessment report forms can be found on the Ontario Central Forms Repository at: [www.forms.ssb.gov.on.ca](http://www.forms.ssb.gov.on.ca).

### Seed Amount Declaration

A Seed Amount Declaration is a written commitment to only plant 50% or less of the total area of your farm operation with neonicotinoid-treated corn and/or soybean seed. Note that the calculation is completed separately by commodity for each of corn and soybeans. In order to purchase neonicotinoid-treated seed, this declaration must be provided to the person from whom farmers are purchasing their seed or to the custom seed treater. The declaration must include:

- the acreage of land on which farmers will plant treated and untreated corn or soybean seed before August 31, 2016, at all of the farm properties that are used for their agricultural operation
- the location of each farm property or a legal description of the property

- the total acreage of all of the application areas where farmers will plant neonicotinoid-treated seeds before August 31, 2016, and all of the farm properties that are used for the agricultural operation

A Seed Amount Declaration is valid only for seed intended to be planted in the 2016 planting season.

**Class 12 pesticides can only be planted in the application area(s) on the farm property(ies) identified in the Seed Amount Declaration form.**

**On or after August 31, 2016**, in preparation for the 2017 planting season, if farmers want to buy and use any amount of neonicotinoid-treated corn and soybean seeds (Class 12 pesticides), they will be required to:

- complete the new integrated pest management (IPM) training
- complete a pest assessment report
- sign a declaration called an IPM Written Declaration Form stating that they have considered IPM principles

Farmers will need to submit these pieces of information, along with their IPM training certificate number, to the sales representative or seed vendor, including direct-to-farm seed vendors, from whom they purchased the seeds or to the custom seed treater used for treating seeds with neonicotinoids.

Class 12 pesticides can only be planted in the application area (or areas) on the farm property(ies) identified in the pest assessment report.

### Integrated Pest Management Training

Integrated pest management (IPM) is an approach to managing pests that is environmentally and economically sustainable. IPM promotes the use of different methods to prevent and reduce the risk of pests and encourage beneficial insects, including pollinators. Under IPM, pesticides are used as a last resort to control pest problems.

Starting on August 31, 2016, successful completion of a new IPM training course will be required in order to purchase and plant neonicotinoid-treated corn and soybean seed. Farmers will need to provide proof that they have completed this training by submitting their certificate number to a sales

representative, vendor or custom seed treater. Certification is valid for 5 years (i.e., farmers will only need to take the course once every 5 years).

Farmers are able to take training in a classroom at various locations or online through the University of Guelph, Ridgetown Campus, at [www.ipmcertified.ca](http://www.ipmcertified.ca). To encourage participation, IPM training will be offered **free of charge** until September 2016.

Farmers do not need to take IPM training if they are a farm owner who hires people to purchase and plant Class 12 pesticides. In this case, the person they hire (e.g., farm manager or supervisor) will need to take IPM training.

An IPM trained person can supervise up to seven people who are planting Class 12 pesticides on the farm. Farmers who do not intend to buy and plant neonicotinoid-treated seeds are not required to take IPM training. Un-treated seed or fungicide-only treated corn and soybean seed, for example, are not Class 12 pesticides.

## Pest Assessment Report

A pest assessment report is documented proof that there is a pest problem that requires the use of neonicotinoid-treated seed to control the pests. In order to purchase Class 12 pesticides, a person (i.e., farmer) must provide a pest assessment report to a vendor, sales representative or custom seed treater.

Pest assessments must be done according to the Conducting a Pest Assessment for Use of Class 12 Pesticides guideline (commonly referred to as the pest assessment guideline). The pest assessment guideline outlines how assessments are to be conducted, sets out the minimum thresholds and explains how to calculate the application area where the Class 12 pesticides are to be planted at the farm property.

There are two kinds of pest assessments: inspection of soil and inspection of a crop.

## Inspection of Soil

Soil pest assessment is a method that confirms the presence of an average of two or more grubs or one wireworm in soil at a farm property (see the pest assessment guideline at: [ontario.ca/document/pest-assessment-guide](http://ontario.ca/document/pest-assessment-guide) for more information on scouting requirements and pest thresholds). A report must verify that pest thresholds have been met or exceeded.

A farmer can choose when to do soil pest scouting. The best time is in the spring or fall.

From August 31, 2015, to August 31, 2016, any farmer can do soil pest scouting, perform a pest assessment and prepare a report.

Starting August 31, 2016, until August 31, 2017, farmers will be able to perform a pest assessment and prepare a report if they have a certificate number from completion of the new integrated pest management (IPM) training.

Starting on August 31, 2017, a requirement that a professional pest advisor conduct a soil pest assessment and prepare a report will begin to be phased in.

For the inspection of soil, an Inspection of Soil — Pest Assessment Report form will need to be completed and signed. The Inspection of Soil — Pest Assessment Report form can be found on the Ontario Central Forms Repository at: [www.forms.ssb.gov.on.ca](http://www.forms.ssb.gov.on.ca).

## Phased-In Professional Pest Advisor — Inspection of Soil

An Inspection of Soil — Pest Assessment Report is required each year. You can use the Pest Assessment Report for the purchase and use of Class 12 pesticides anytime within the 12 months from the date of the inspection for the application areas listed on the form. The requirement to have a professional pest advisor perform a soil pest assessment is being phased in over time on a geographic basis. See Table 10–1 for the phase-in schedule.

Once the professional pest advisor requirement is phased in, a professional pest advisor will need to perform or supervise the assessment and complete a report at least once every 3 years. The IPM certified farmer can continue to conduct pest assessments in those years that the PPA is not required.

Farmers will need to refer to the schedule below of the counties and regions of Ontario to know when professional pest advisors are required for their area.

The table below gives the implementation date for when a Professional Pest Advisor must first conduct or supervise the soil inspection in the assigned geographic areas of Ontario, called Schedules. After the phase-in date, a Professional Pest Advisor is required to conduct a soil inspection at least once every 3 years.

**Table 10–1.** Professional Pest Advisor Requirement Phase-In

| Date         | Schedule   | Counties or Regions                                                                                                                                                                                                                                                                                              |
|--------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Aug 31, 2017 | Schedule 1 | Dufferin, Frontenac, Halton, Lambton, Middlesex, Muskoka, Prince Edward, Stormont, Dundas, Glengarry, Toronto, Wellington                                                                                                                                                                                        |
| Aug 31, 2018 | Schedule 2 | Bruce, Elgin, Grey, Haldimand, Hamilton, Huron, Nipissing, Norfolk, Ottawa, Oxford, Peel, Sudbury, Waterloo                                                                                                                                                                                                      |
| Aug 31, 2019 | Schedule 3 | Algoma, Brant, Chatham-Kent, Cochrane, Durham, Essex, Haliburton, Hastings, Kawartha Lakes, Kenora, Lanark, Leeds and Grenville, Lennox and Addington, Manitoulin, Niagara, Northumberland, Parry Sound, Perth, Peterborough, Prescott and Russell, Rainy River, Renfrew, Simcoe, Thunder Bay, Timiskaming, York |

### **Inspection of a Crop**

This method determines if the percentage of stand loss caused by specific pests is:

- at least 15% in corn caused by wireworms, grubs, seedcorn maggot or corn rootworm
- at least 30% in soybean caused by wireworms, grubs, seedcorn maggot or bean leaf beetle

If a farmer believes they have experienced crop damage from pests, they can choose to have a crop damage assessment conducted. A professional pest advisor will be required to conduct this assessment as this method requires specialized knowledge of pests and crop damage.

For the crop damage pest assessment method, an Inspection of a Crop — Pest Assessment Report form will need to be completed and signed by

a professional pest advisor. The Inspection of Crop — Pest Assessment Report form can be found on the Ontario Central Forms Repository at: [www.forms.ssb.gov.on.ca](http://www.forms.ssb.gov.on.ca).

### **Submitting a Completed Pest Assessment Report**

Farmers will need to provide the completed pest assessment report form to the vendor and/or the treated seed sales representative from whom they purchase their neonicotinoid-treated seeds or to a custom seed treater to have seed treated with neonicotinoid insecticides. Farmers must also keep a copy of the report at their farm for at least 2 years.

The vendor or custom seed treater will then submit the report to the Ontario Ministry of Agriculture, Food and Rural Affairs.

#### **For more information, contact:**

Ministry of the Environment and Climate Change  
Public Information Centre  
Tel: 416-325-4000 or toll free: 1-800-565-4923  
E-mail: [picemail.moe@ontario.ca](mailto:picemail.moe@ontario.ca)

Ontario Ministry of Agriculture, Food and Rural Affairs  
Tel: 1-877-424-1300 or TTY 1-855-696-2811  
E-mail: [ag.info.omafra@ontario.ca](mailto:ag.info.omafra@ontario.ca)

# 11. Appendices

## Appendix A.

Manufacturers of Pesticides Listed in Publication 812

### **Adama Canada Limited**

302-179 McDermot Ave  
Winnipeg, Manitoba R3B 0S1  
Tel 1-855-264-6262  
[www.adama.com/canada](http://www.adama.com/canada)

### **Amvac Chemical Corporation**

4695 MacArthur Court, Suite 1200  
Newport Beach, CA US 92660  
Tel 323-264-3910  
[www.amvac-chemical.com/](http://www.amvac-chemical.com/)

### **BASF Canada Inc.**

100 Milverton Dr., 5th Floor  
Mississauga, ON L5R 4H1  
Tel 1-866-485-BASF (2273)  
Fax 289-360-6000  
[www.agsolutions.ca](http://www.agsolutions.ca)

### **Bayer CropScience Inc.**

679 Southgate Drive  
2nd Floor  
Guelph, ON N1G 4S2  
Tel 1-888-283-6847  
Fax 403-723-7488  
[www.bayercropscience.ca](http://www.bayercropscience.ca)

### **Dow AgroSciences Solutions Centre**

2100-450 1 St. SW  
Calgary AB T2P 5H1  
Tel 1-800-667-3852  
Fax 1-888-296-6188  
[www.dowagro.ca](http://www.dowagro.ca)

### **E.I. DuPont Canada Inc.**

7070 Mississauga Rd., P.O. Box 2300  
Streetsville, ON L5M 2J4  
Tel 1-800-387-2122  
Fax 905-821-5057  
[www.dupont.ca](http://www.dupont.ca)

### **Engage Agro Corp.**

1030 Gordon St.  
Guelph, ON N1G 4X5  
Tel 519-826-7878  
Fax 519-826-7675  
[www.engageagro.com](http://www.engageagro.com)

### **Gowan Company**

370 Main St.  
Yuma, AZ US 85364  
Tel 1-800-883-1844, ext. 2  
[www.gowanco.com](http://www.gowanco.com)

### **HeadsUp Plant Protectants Ltd.**

207 Queen Elizabeth Blvd. West  
Box 519  
Kamsack, SK S0A 1S0  
[www.sar-headsup.ca](http://www.sar-headsup.ca)

### **Interprovincial Cooperative Ltd.**

945 Marion St.  
Winnipeg, MB R2J 0K7  
Tel 204-233-3461  
Fax 204-233-8462  
[www.ipco.ca](http://www.ipco.ca)

### **Macdermid Agricultural Solutions Canada Limited**

400 Michener Road, Unit 2  
Guelph, ON N1K 1E4

### **Monsanto Canada**

900 – One Research Road  
Winnipeg, MB R3T 6E3  
Tel 1-800-667-4944  
Fax 1-888-556-5565  
[www.monsanto.ca](http://www.monsanto.ca)

### **Neudorff North America**

P.O. Box 178  
Brentwood Bay, BC V8M 1R3  
Tel 250-652-5888  
[www.neudorffpro.com](http://www.neudorffpro.com)

### **Norac Concepts Inc.**

P.O. Box 31097  
Guelph, ON N1H 8K1  
Tel 519-821-3633  
Fax 519-821-2083  
[www.noracconcepts.com](http://www.noracconcepts.com)

### **Syngenta Canada Inc.**

140 Research Lane  
Guelph, ON N1G 4Z3  
Tel 1-877-964-3682  
Fax 1-877-214-5405  
[www.syngenta.ca](http://www.syngenta.ca)

### **United Agri Products Canada Inc.**

789 Donnybrook Dr.  
Dorchester, ON N0L 1G5  
Tel 1-800-265-4624  
Fax 519-268-8013  
[www.uap.ca](http://www.uap.ca)

### **Valent BioSciences Canada, Ltd.**

130 Research Lane, Unit 6  
Guelph, ON N1G 5G3  
Tel 519-767-9262  
Fax 925-817-5026  
[www.valent.ca](http://www.valent.ca)

**Appendix B.**

## Ontario Ministry of Agriculture, Food and Rural Affairs Field Crop Advisory Staff List by Location

| Location/role                                                                                                             | Crop Advisory Staff | Tel/Fax |                          | E-mail                     |
|---------------------------------------------------------------------------------------------------------------------------|---------------------|---------|--------------------------|----------------------------|
| <b>Brighton Resource Centre</b><br>95 Dundas St. E., RR#3, Brighton, ON K0K 1H0                                           |                     | Tel     | 613-475-1630             |                            |
|                                                                                                                           |                     | Fax     | 613-475-3835             |                            |
| <b>Guelph OMAFRA</b><br>1 Stone Rd. W., Guelph, ON N1G 4Y2                                                                |                     |         |                          |                            |
| Crop Protection Program Lead                                                                                              | Denise Beaton       | Tel     | 519-826-6594             | denise.beaton@ontario.ca   |
|                                                                                                                           |                     | Fax     | 519-826-4964             |                            |
| Minor Use Coordinator                                                                                                     | Jim Chaput          | Tel     | 519-826-3539             | jim.chaput@ontario.ca      |
|                                                                                                                           |                     | Fax     | 519-826-4964             |                            |
| <b>Harrow</b><br>Greenhouse and Processing Crops Research Centre, 2585 County Road 20, Harrow, ON N0R 1G0                 |                     | Tel     | 519-738-2251             |                            |
|                                                                                                                           |                     | Fax     | 519-738-4564             |                            |
| <b>Kemptville Resource Centre</b><br>P.O. Box 2004, Concession Road, Kemptville, ON K0G 1J0                               |                     | Tel     | 613-258-8295             |                            |
|                                                                                                                           |                     | Fax     | 613-258-8392             |                            |
| Emerging Crops Specialist                                                                                                 | Scott Banks         | Tel     | 613-258-8359             | scott.banks@ontario.ca     |
| <b>Lindsay Resource Centre</b><br>322 Kent St. W., Lindsay, ON K9V 2Z9                                                    |                     | Tel     | 705-324-6125             |                            |
|                                                                                                                           |                     | Fax     | 705-324-1638             |                            |
| <b>New Liskeard</b><br>280 Armstrong St., P.O. Box 4070, New Liskeard, ON P0J 1P0                                         |                     | Tel     | 1-800-461-6132           |                            |
|                                                                                                                           |                     | Fax     | 705-647-7993             |                            |
| <b>Ridgetown Resource Centre</b><br>Agronomy Building, Ridgetown College, P.O. Box 400, Main St. E, Ridgetown, ON N0P 2C0 |                     | Tel     | 519-674-1690             |                            |
|                                                                                                                           |                     | Fax     | 519-674-1564             |                            |
| Entomology, Field Crops Program Lead                                                                                      | Tracey Baute        | Tel     | 519-674-1696             | tracey.baute@ontario.ca    |
| Pathologist – Field Crops Program Lead                                                                                    | Albert Tenuta       | Tel     | 519-674-1617             | albert.tenuta@ontario.ca   |
| Soil Management Specialist – Field Crops                                                                                  | Adam Hayes          | Tel     | 519-674-1621             | adam.hayes@ontario.ca      |
| <b>Simcoe Resource Centre</b><br>P.O. Box 587, Blueline Rd. & Hwy #3, Simcoe, ON N3Y 4N5                                  |                     | Tel     | 519-426-7120             |                            |
|                                                                                                                           |                     | Fax     | 519-428-1142             |                            |
| Application Technology Specialist                                                                                         | Jason Deveau        | Tel     | 519-426-8934             | jason.deveau@ontario.ca    |
| <b>Stratford Resource Centre</b><br>63 Lorne Ave. E., Suite 2B, Stratford, ON N5A 6S4                                     |                     | Tel     | 519-271-0280             |                            |
|                                                                                                                           |                     | Fax     | 519-273-5278             |                            |
| Canola & Edible Beans Specialist                                                                                          | Meghan Moran        | Tel     | 519-271-0083             | meghan.moran@ontario.ca    |
| Cereals Specialist                                                                                                        | Joanna Follings     | Tel     | 519-271-8180             | joanna.follings@ontario.ca |
| Soil Fertility Specialist                                                                                                 | Jake Munroe         | Tel     | 519-271-9269             | jake.munroe@ontario.ca     |
| Soybean Specialist                                                                                                        | Horst Bohner        | Tel     | 519-271-5858             | horst.bohner@ontario.ca    |
| <b>University of Guelph</b><br>50 Stone Rd. E., Guelph, ON N1G 2W1                                                        |                     | Tel     | 519-824-4120             |                            |
| Applied Research Coordinator – Field Crops<br>Crop Science Building                                                       | Ian McDonald        | Tel     | 519-824-4120, ext. 56707 | ian.mcdonald@ontario.ca    |
|                                                                                                                           |                     | Fax     | 519-763-8933             |                            |
| Corn Industry Program Lead<br>Crop Science Building                                                                       | Ben Rosser          | Tel     | 519-824-4120, ext. 54865 | ben.rosser@ontario.ca      |
|                                                                                                                           |                     | Fax     | 519-763-8933             |                            |

**Appendix B.**

## Ontario Ministry of Agriculture, Food and Rural Affairs Field Crop Advisory Staff List by Location

| Location/role                                                                                                              | Crop Advisory Staff | Tel/Fax |                          | E-mail                      |
|----------------------------------------------------------------------------------------------------------------------------|---------------------|---------|--------------------------|-----------------------------|
| Weed Management Field Crops Program Lead,<br>Crop Science Building, Room 303                                               | Mike Cowbrough      | Tel     | 519-824-4120, ext. 52580 | mike.cowbrough@ontario.ca   |
|                                                                                                                            |                     | Fax     | 519-763-8933             |                             |
| <b>Vineland – University of Guelph</b><br>4890 Victoria Ave. N., P.O. Box 7000, Vineland Station, ON L0R 2E0               |                     | Tel     | 905-562-4141             |                             |
|                                                                                                                            |                     | Fax     | 905-562-3413             |                             |
| <b>Vineland Resource Centre</b><br>Adv. Serv. Building, P.O. Box 8000, 4890 Victoria Ave. N., Vineland Station, ON L0R 2E0 |                     | Tel     | 905-562-4147             |                             |
|                                                                                                                            |                     | Fax     | 905-562-5933             |                             |
| <b>Woodstock Resource Centre</b><br>P.O. Box 666, Hwy. #59 N, Woodstock, ON N4S 7Z5                                        |                     | Tel     | 519-537-6621             |                             |
|                                                                                                                            |                     | Fax     | 519-539-5351             |                             |
| Nutrient Management Field Crops Program Lead                                                                               | Christine Brown     | Tel     | 519-537-8305             | christine.brown1@ontario.ca |

**Agricultural Information Contact Centre**

Provides province-wide, toll-free technical and business information to commercial farms, agri-businesses and rural businesses.

1 Stone Rd. W.

Guelph, ON N1G 4Y2

Tel 519-826-4047

Toll-free 1-877-424-1300

Fax 519-826-7610

E-mail [ag.info.omafra@ontario.ca](mailto:ag.info.omafra@ontario.ca)

A complete list of Agriculture Development Branch staff can be found on the OMAFRA website at [ontario.ca/omafra](http://ontario.ca/omafra).

**Appendix C.**

## Ontario Ministry of the Environment and Climate Change Regional Contact Information

| <b>REGION<br/>County</b>                                                                                                                                                                                                                                                            | <b>Address</b>                                                                     | <b>Telephone/Fax</b>                                             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------|
| <b>Central Region</b><br>Toronto, Halton, Peel York, Durham, Muskoka, Simcoe                                                                                                                                                                                                        | 5775 Yonge St., 8th Floor<br>Toronto, ON M2M 4J1                                   | Tel 416-326-6700<br>Toll-free 1-800-810-8048<br>Fax 416-3256345  |
| <b>West-Central Region</b><br>Haldimand, Norfolk, Niagara, Hamilton-Wentworth, Dufferin, Wellington, Waterloo, Brant                                                                                                                                                                | Ontario Government Building<br>119 King St. W., 12th Floor<br>Hamilton, ON L8P 4Y7 | Tel 905-521-7640<br>Toll-free 1-800-668-4557<br>Fax 905-521-7820 |
| <b>Eastern Region</b><br>Frontenac, Hastings, Lennox & Addington, Prince Edward, Leeds & Grenville, Prescott & Russell, Stormont/<br>Dundas & Glengarry, Haliburton, Peterborough, City of Kawartha Lakes, Northumberland, Renfrew, Ottawa,<br>Lanark (Township of South Algonquin) | 1259 Gardiners Rd., Unit 3<br>P.O. Box 22032<br>Kingston, ON K7M 8S5               | Tel 613-549-4000<br>Toll-free 1-800-267-0974<br>Fax 613-548-6908 |
| <b>Southwestern Region</b><br>Elgin, Middlesex, Oxford, Essex, Kent, Lambton, Bruce, Grey, Huron, Perth                                                                                                                                                                             | 733 Exeter Rd., 2nd Floor<br>London, ON N6E 1L3                                    | Tel 519-873-5000<br>Toll-free 1-800-265-7672<br>Fax 519-873-5020 |
| <b>Northern Region (EAST)</b><br>Manitoulin, Nipissing, Parry Sound, Sudbury, Algoma (East), Timiskaming, Sault Ste. Marie                                                                                                                                                          | 199 Larch St., Suite 1201<br>Sudbury, ON P3E 5P9                                   | Tel 705-564-3237<br>Toll-free 1-800-890-8516<br>Fax 705-564-4180 |
| <b>Northern Region (West)</b><br>Algoma (West), Cochrane, Kenora, Rainy River, Timmins, Thunder Bay                                                                                                                                                                                 | 435 James St. S., Suite 331, 3rd Floor<br>Thunder Bay, ON P7E 6S7                  | Tel 807-475-1205<br>Toll-free 1-800-875-7772<br>Fax 705-475-1754 |
| <b>Standards Development Branch</b>                                                                                                                                                                                                                                                 | Pesticides Section<br>40 St. Clair Ave. W., 7th Floor<br>Toronto, ON M4V 1M2       | Tel 416-327-5519<br>Fax 416-327-2936                             |
| <b>Approvals Branch</b>                                                                                                                                                                                                                                                             | Pesticides Licensing<br>2 St. Clair Ave. W., 12A Floor<br>Toronto, ON M4V 1L5      | Tel 416-314-8001<br>Toll-free 1-800-461-6290<br>Fax 416-314-8452 |

**Appendix D.**  
Other Contacts

**AGRICULTURE & AGRI-FOOD CANADA  
RESEARCH CENTRES**

[www.agr.gc.ca/index\\_e.php](http://www.agr.gc.ca/index_e.php)

**Eastern Cereals and Oilseeds Research Centre**

960 Carling Ave.  
Ottawa, ON K1A 0C6  
Tel 613-759-1858

**Greenhouse and Processing Crops Centre**

2585 County Road 20  
Harrow, ON NOR 1G0  
Tel 519-738-2251

**Southern Crop Protection and Food Research Centre**

1391 Sandford St.  
London, ON N5V 4T3  
Tel 519-457-1470

**Vineland Research Farm**

4902 Victoria Ave. N.  
Vineland, ON L0R 2E0  
Tel 905-562-4113

**Guelph Food Research Centre**

93 Stone Rd. W.  
Guelph, ON N1G 5C9  
Tel 519-829-2400

**UNIVERSITY OF GUELPH**

**Main Campus**

Guelph, ON N1G 2W1  
Tel 519-824-4120  
[www.uoguelph.ca](http://www.uoguelph.ca)

**Ridgetown Campus**

Ridgetown, ON NOP 2C0  
Tel 519-674-1500  
[www.ridgetownc.uoguelph.ca](http://www.ridgetownc.uoguelph.ca)

**Department of Plant Agriculture**

[www.plant.uoguelph.ca](http://www.plant.uoguelph.ca)

**Department of Plant Agriculture, Guelph**

50 Stone Rd. E.  
Guelph, ON N1G 2W1  
Tel 519-824-4120, ext. 56083 or 52693

**Department of Plant Agriculture, Simcoe**

1283 Blueline Rd., Box 587  
Simcoe, ON N3Y 4N5  
Tel 519-426-7127

**Department of Plant Agriculture, Vineland**

Box 7000, 4890 Victoria Ave. N.  
Vineland Station, ON L0R 2E0  
Tel 905-562-4141

**Lab Services Division**

95 Stone Rd. W.  
Guelph, ON N1H 8J7  
Tel 519-767-6299  
[www.uoguelph.ca/labserv/](http://www.uoguelph.ca/labserv/)

**Trace Organic and Pesticide Contaminants**

Tel 519-823-1268

**Pest Diagnostic Clinic**

Tel 519-767-6256

**VINELAND RESEARCH AND INNOVATION  
CENTRE**

4890 Victoria Ave. N.  
Vineland Station, ON L0R 2E0  
Tel 905-562-0320  
[www.vinelandresearch.com](http://www.vinelandresearch.com)

## Appendix E.

### Diagnostic Service

Samples for disease diagnosis, insect or weed identification, nematode counts and verticillium testing can be sent to:

University of Guelph  
Laboratory Services Division  
Pest Diagnostic Clinic  
95 Stone Rd. W.  
Guelph, ON N1H 8J7

Tel 519-767-6299  
Fax 519-767-6240  
E-mail [aflinfo@uoguelph.ca](mailto:aflinfo@uoguelph.ca)

[www.guelphlabservices.com](http://www.guelphlabservices.com)

Payment must accompany samples at the time of submission. Submission forms are available at: [www.guelphlabservices.com/AFL/submit\\_samples.aspx](http://www.guelphlabservices.com/AFL/submit_samples.aspx).

### How to Sample for Nematodes

#### Soil

##### When to sample

Soil and root samples can be taken at any time of the year that the soil is not frozen. In Ontario, nematode soil population levels are generally at their highest in May and June and again in September and October.

##### How to sample soil

Use a soil sampling tube, trowel or narrow-bladed shovel to take samples. Sample soil to a depth of 20–25 cm (8–10 in.). If the soil is bare, remove the top 2 cm (1 in.) prior to sampling. A sample should consist of 10 or more subsamples combined. Mix well. Then take a sample of 0.5–1 L (1 pint–1 quart) from this. No single sample should represent more than 2.5 ha (6.25 acres). Mix subsamples in a clean pail or plastic bag.

##### Sampling pattern

If living crop plants are present in the sample area, take samples within the row and from the area of the feeder root zone (with trees, this is the drip line).

#### Number of subsamples

Based on the total area sampled:

|                                                                |               |
|----------------------------------------------------------------|---------------|
| 500 m <sup>2</sup> (5,400 ft <sup>2</sup> )                    | 10 subsamples |
| 500 m <sup>2</sup> –0.5 ha (5,400 ft <sup>2</sup> –1.25 acres) | 25 subsamples |
| 0.5 ha–2.5 ha (1.25–6.25 acres)                                | 50 subsamples |

#### Roots

For small plants, sample the entire root system plus adhering soil. For large plants, 10–20 g ( $\frac{1}{2}$ –1 oz.), dig fresh weight from the feeder root zone and submit.

#### Problem areas

Take soil and root samples from the margins of the problem area where the plants are still living. If possible, also take samples from healthy areas in the same field. If possible, take both soil and root samples from problem and healthy areas in the same field.

### Sample Handling

#### Soil samples

Place in plastic bags as soon as possible after collecting.

#### Root samples

Place in plastic bags and cover with moist soil from the sample area.

#### Storage

Store samples at 5°C–10°C and do not expose them to direct sunlight or extreme heat or cold (freezing). Only living nematodes can be counted. Accurate counts depend on proper handling of samples.

### Submitting Plant for Disease Diagnosis or Identification

#### Sample submission forms

Forms can be obtained from your local Ministry of Agriculture, Food and Rural Affairs (OMAFRA) office or by calling the Agricultural Information Contact Centre at 1-877-424-1300. Carefully fill in all the categories on the form. In the space provided, draw the most

obvious symptom and the pattern of the disease in the field. It is important to include the cropping history of the area for the past 3 years and pesticide use records from this year.

Choose a complete, representative sample showing early symptoms. Submit as much of the plant as is practical, including the root system, or several plants showing a range of symptoms. If symptoms are general, collect the sample from an area where they are of intermediate severity. Completely dead material is usually inadequate for diagnosis.

With plant specimens submitted for identification, include at least a 20–25-cm sample of the top portion of the stem with lateral buds, leaves, flowers or fruits in identifiable condition. Wrap plants in newspaper and put in a plastic bag. Tie the root system off in a separate plastic bag to avoid the soil drying out and contaminating the leaves. Do not add moisture, as this encourages decay in transit. Cushion specimens and pack in a sturdy box to avoid damage during shipping. Avoid leaving specimens to bake or freeze in a vehicle or in a location where they could deteriorate.

#### Delivery

Deliver to the Pest Diagnostic Clinic as soon as possible by first class mail or courier at the beginning of the week.

### Submitting Insect Specimens for Identification

#### Collecting samples

Place dead, hard-bodied insects in vials or boxes and cushion with tissues or cotton. Place soft-bodied insects and caterpillars in vials containing alcohol. Do not use water, as this results in rot. Do not tape insects to paper or send them loose in an envelope.

Place live insects in a container with enough plant “food” to support them during transit. Be sure to write “live” on the outside of the container.

**Appendix F.****Pesticide Groups Based on Sites of Action — Insecticides**

The classification scheme listed below is adapted from the Insecticide Action Committee Mode of Action Classification (IRAC) V8, December 2015.

| <b>Group #</b> | <b>Primary Site of Action</b>                           | <b>Group Name</b>                      | <b>Product name(s)<sup>1</sup></b>                                                                                                                                          |
|----------------|---------------------------------------------------------|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1B             | acetylcholine esterase (AChE) inhibitors                | organophosphate                        | Counter 15 G, Cygon 480, Imidan 50 WP, Lagon 480, Lorsban 4E, Lorsban 15 G, Malathion 500 E, Monitor 480, Pyrifos 15 G, Pyrifos 50 W, Pyrinex 480 EC                        |
| 3A             | sodium channel modulators                               | pyrethroid                             | Ambush 500EC, Concep, Decis 5 EC, Endigo, Force 3.0G, Matador 120 EC, Pounce 384 EC, Mako, Silencer 120EC, Voliam Xpress                                                    |
| 4A             | nicotinic acetylcholine receptor competitive modulators | neonicotinoids                         | Alias 240 SC, Concept, Cruiser 5FS, Cruiser 350FS, Gaucho 480 FL, Gaucho GS, Helix Vibrance, NipsIt Inside 600, NipsIt Suite, Poncho 600, Sombrero 600FS, Stress Shield 600 |
| 4C             | nicotinic acetylcholine receptor competitive modulators | sulfoximines                           | Transform WG                                                                                                                                                                |
| 4D             | nicotinic acetylcholine receptor competitive modulators | butenolides                            | Sivanto Prime                                                                                                                                                               |
| 5              | nicotinic acetylcholine allosteric modulators           | naturyte/spinosyns                     | Success 480 SC, Delegate                                                                                                                                                    |
| 11             | microbial disruptors of insect midgut membranes         | biologicals                            | Bioprotec CAF, Dipex 2X DF, Novodor, Thuricide HPS                                                                                                                          |
| 18             | ecdysone receptor agonists                              | diacylhydrazines                       | Intrepid                                                                                                                                                                    |
| 23             | inhibitors of acetyl CoA carboxylase                    | tetronic and tetramic acid derivatives | Movento                                                                                                                                                                     |
| 24             | mitochondrial complex IV electron transport inhibitors  | inorganics (aluminum phosphide)        | Fumitoxin, Phostoxin, Gastoxin                                                                                                                                              |
| 28             | ryanodine receptor modulators                           | diamides                               | Coragen, Lumiderm, Voliam Xpress, Fortenza                                                                                                                                  |

<sup>1</sup> Some products are listed in more than one group because they contain more than one active ingredient from different groups

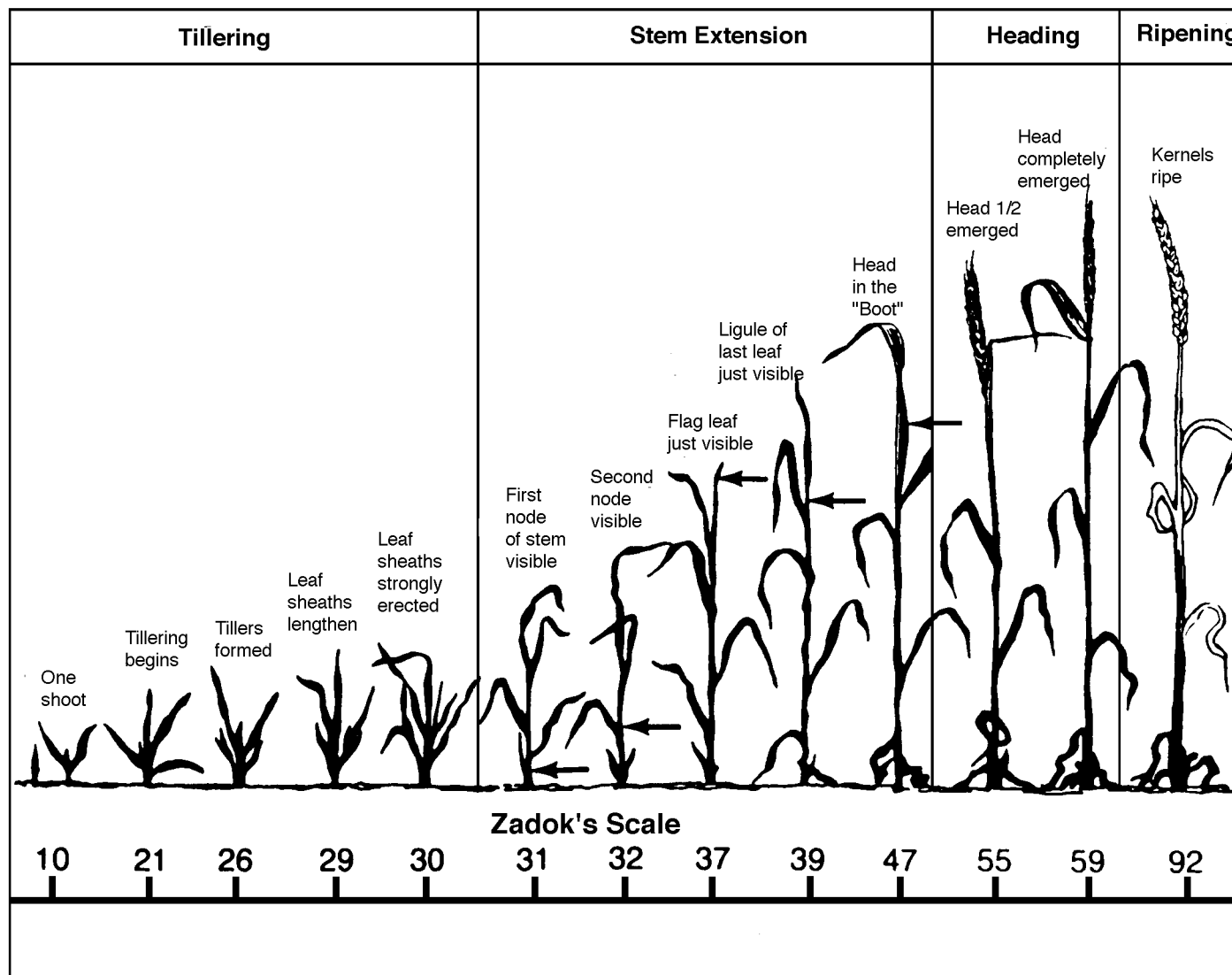
**Appendix G.**

## Pesticide Groups Based on Sites of Action — Fungicides

This classification scheme is based on the Fungicide Resistance Action Committee (FRAC) Code List, 2015.

| <b>Group #</b> | <b>Primary Site of Action</b>                                                            | <b>Group Name</b>                         | <b>Product name(s)</b>                                                                                                                                                                                                                                                             | <b>Risk of Developing Resistance</b> |
|----------------|------------------------------------------------------------------------------------------|-------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| 1              | mitosis and cell division ( $\beta$ -tubulin assembly)                                   | methyl-benzimidazole carbamates           | DCT, Senator 70 WP                                                                                                                                                                                                                                                                 | high                                 |
| 2              | signal transduction (MAP/Histidine-kinase)                                               | dicarboximide                             | Ronilan EG, Rovral WP                                                                                                                                                                                                                                                              | medium to high                       |
| 3              | sterol synthesis in membranes                                                            | DMI (demethylation inhibitors)            | Bumper 418 EC, Caramba, Dividend XL RTA, Folicur 250 EW, Folicur 432F, Gemini, Proline 480 SC, Prosaro 250 EC, Quilt, Stratego 250 EC, Tilt 250 E, Rancona Apex, Raxil T, Raxil MD, Topas 250 E, Helix Vibrance, Vortex FL, Twinline, Propulse, Blanket AP, Fullback 125 SC, Quash | medium                               |
| 4              | nucleic acids synthesis                                                                  | phenylamides                              | Allegiance FL, Apron FL, Apron XL LS, Apron Maxx, Helix Vibrance, Prosper, Raxil MD                                                                                                                                                                                                | high                                 |
| 7              | respiration (complex II: succinate-dehydrogenase)                                        | SDHI (succinate dehydrogenase inhibitors) | Anchor, Lance WDG, Vitaflo 280, Vitavax RS, Gaucho CS, Priaxor, Prosper, Fontelis, Vertisan, Propulse, Blanket AP                                                                                                                                                                  | medium                               |
| 9              | amino acid and protein synthesis (methionine biosynthesis)                               | aniline-pyrimidines                       | Astound                                                                                                                                                                                                                                                                            | medium                               |
| 11             | respiration (complex III: cytochrome bc <sub>1</sub> )                                   | Qol (quinone outside inhibitors)          | Cabrio EG, Dynasty 100, Headline EC, Quadris, Quilt, Stratego 250EC, Reason 500 SC, Tanos 50 DF, Trilex FS, Priaxor, Twinline, Acapela                                                                                                                                             | high                                 |
| 12             | signal transduction (MAP/Histidine-kinase)                                               | phenylpyrroles                            | Maxim 480 FS, Apron Maxx, Helix Vibrance, Astound                                                                                                                                                                                                                                  | low to medium                        |
| 14             | lipid synthesis and membrane integrity (lipid peroxidation (proposed))                   | aromatic hydrocarbon                      | Botran 75 W, Quintozene 75 WP                                                                                                                                                                                                                                                      | low to medium                        |
| 29             | respiration (uncoupler of oxidative phosphorylation)                                     | 2,6-dinitro-anilines                      | Allegro 500F                                                                                                                                                                                                                                                                       | low                                  |
| 44             | lipid synthesis and membrane integrity (microbial disrupters of pathogen cell membranes) | microbial                                 | Contrans, Serenade ASO                                                                                                                                                                                                                                                             | resistance not known                 |
| M1             | multi-site, contact                                                                      | inorganic                                 | Copper Spray, Copper 53 W, Kocide 101 WP, Kocide DF, Microscopic Sulphur, Oxidate, Parasol WP, Cueva                                                                                                                                                                               | low                                  |
| M3             | multi-site, contact                                                                      | dithiocarbamate                           | Anchor, Acrobat MZ, Dithane, Dithane F 45, Ferbam 76 WDG, Gavel 75 DF, Manzate DF, Penncozeb 80, Polyram DF, Ridomil Gold, Thiram 75 WP, Vitaflo 280, Vitavax RS, Zineb 80 W, Gaucho CS, Prosper, Gemini                                                                           | low                                  |
| M4             | multi-site, contact                                                                      | phthalimide                               | Captan, DCT, Maestro 75 DF, Supra Captan 80 WDG                                                                                                                                                                                                                                    | low                                  |
| M5             | multi-site, contact                                                                      | chloronitrile                             | Bravo 500, Tatoo C                                                                                                                                                                                                                                                                 | low                                  |

**Appendix H.**  
Cereal Growth Stages



**Appendix I.**  
The Metric System

| Metric units                                             | Dry weight conversions (approximate)                    | Application rate conversions                                      |
|----------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------------------------|
| <b>Linear measures (length)</b>                          | <b>Metric Imperial</b>                                  | <b>Metric to Imperial or U.S. (approximate)</b>                   |
| 10 millimetres (mm) = 1 centimetre (cm)                  | <b>grams or kilograms/hectare ounces or pounds/acre</b> | litres per hectare × 0.09 = Imp. gallons per acre                 |
| 100 centimetres (cm) = 1 metre (m)                       | 100 g/ha = 1½ oz/acre                                   | litres per hectare × 0.11 = U.S. gallons per acre                 |
| 1,000 metres = 1 kilometre (km)                          | 200 g/ha = 3 oz/acre                                    | litres per hectare × 0.36 = Imp. quarts per acre                  |
| <b>Square measures (area)</b>                            | 300 g/ha = 4¼ oz/acre                                   | litres per hectare × 0.43 = U.S. quarts per acre                  |
| 100 m × 100 m = 10,000 m² = 1 hectare (ha)               | 500 g/ha = 7 oz/acre                                    | litres per hectare × 0.71 = Imp. pints per acre                   |
| 100 ha = 1 square kilometre (km²)                        | 700 g/ha = 10 oz/acre                                   | litres per hectare × 0.86 = U.S. pints per acre                   |
| <b>Cubic measures (volume)</b>                           | 1.10 kg/ha = 1 lb/acre                                  | millilitres per hectare × 0.014 = U.S. fluid ounces per acre      |
| <b>Dry measure</b>                                       | 1.50 kg/ha = 1¼ lb/acre                                 | grams per hectare × 0.014 = ounces per acre                       |
| 1,000 cubic millimetres (mm³) = 1 cubic centimetre (cm³) | 2.00 kg/ha = 1¾ lb/acre                                 | kilograms per hectare × 0.89 = pounds per acre                    |
| 1,000,000 cm³ = 1 cubic metre (m³)                       | 2.50 kg/ha = 2¼ lb/acre                                 | tonnes per hectare × 0.45 = tons per acre                         |
| <b>Liquid measure</b>                                    | 3.25 kg/ha = 3 lb/acre                                  |                                                                   |
| 1,000 millilitres (mL) = 1 litre (L)                     | 4.00 kg/ha = 3½ lb/acre                                 | <b>Imperial or U.S. to metric (approximate)</b>                   |
| 100 L = 1 hectolitre (hL)                                | 5.00 kg/ha = 4½ lb/acre                                 | Imp. gallons per acre × 11.23 = litres per hectare (L/ha)         |
| <b>Weight-volume equivalents (for water)</b>             | 6.00 kg/ha = 5¼ lb/acre                                 | U.S. gallons per acre × 9.35 = litres per hectare (L/ha)          |
| (1.00 kg) 1,000 grams = 1 litre (1.00 L)                 | 7.50 kg/ha = 6¾ lb/acre                                 | Imp. quarts per acre × 2.8 = litres per hectare (L/ha)            |
| (0.50 kg) 500 g = 500 mL (0.50 L)                        | 9.00 kg/ha = 8 lb/acre                                  | U.S. quarts per acre × 2.34 = litres per hectare (L/ha)           |
| (0.10 kg) 100 g = 100 mL (0.10 L)                        | 11.00 kg/ha = 10 lb/acre                                | Imp. pints per acre × 1.4 = litres per hectare (L/ha)             |
| (0.01 kg) 10 g = 10 mL (0.01 L)                          | 13.00 kg/ha = 11½ lb/acre                               | U.S. pints per acre × 1.17 = litres per hectare (L/ha)            |
| (0.001 kg) 1 g = 1 mL (0.001 L)                          | 15.00 kg/ha = 13½ lb/acre                               | Imp. fluid ounces per acre × 70 = millilitres per hectare (mL/ha) |
| <b>Weight measures</b>                                   |                                                         | U.S. fluid ounces per acre × 73 = millilitres per hectare (mL/ha) |
| 1,000 milligrams (mg) = 1 gram (g)                       | <b>Liquid equivalents (approximate)</b>                 | tons per acre × 2.24 = tonnes per hectare (t/ha)                  |
| 1,000 g = 1 kilogram (kg)                                | 50 L/ha = 4.45 gal/acre (5.35 US gal/acre)              | pounds per acre × 1.12 = kilograms per hectare (kg/ha)            |
| 1,000 kg = 1 tonne (t)                                   | 100 L/ha = 8.90 gal/acre (10.70 US gal/acre)            | pounds per acre × 0.45 = kilograms per acre (kg/acre)             |
| 1 mg/kg = 1 part per million (ppm)                       | 150 L/ha = 13.35 gal/acre (16.05 US gal/acre)           | ounces per acre × 70 = grams per hectare (g/ha)                   |
| <b>Dry-liquid equivalents</b>                            | 200 L/ha = 17.80 gal/acre (21.40 US gal/acre)           |                                                                   |
| 1 cm³ = 1 mL                                             | 250 L/ha = 22.25 gal/acre (26.75 US gal/acre)           | <b>Metric conversions</b>                                         |
| 1 m³ = 1,000 L                                           | 300 L/ha = 26.70 gal/acre (32.10 US gal/acre)           | 5 mL = 1 tsp                                                      |
|                                                          |                                                         | 15 mL = 1 tbsp                                                    |
|                                                          |                                                         | 28.5 mL = 1 imp. fl. oz.                                          |

**Conversion tables – metric to imperial (approximate)**

|                                                             |
|-------------------------------------------------------------|
| <b>Length</b>                                               |
| 1 millimetre (mm) = 0.04 inches                             |
| 1 centimetre (cm) = 0.40 inches                             |
| 1 metre (m) = 39.40 inches                                  |
| 1 metre (m) = 3.28 feet                                     |
| 1 metre (m) = 1.09 yards                                    |
| 1 kilometre (km) = 0.62 miles                               |
| <b>Area</b>                                                 |
| 1 square centimetre (cm <sup>2</sup> ) = 0.16 square inches |
| 1 square metre (m <sup>2</sup> ) = 10.77 square feet        |
| 1 square metre (m <sup>2</sup> ) = 1.20 square yards        |
| 1 square kilometre (km <sup>2</sup> ) = 0.39 square miles   |
| 1 hectare (ha) = 107,636 square feet                        |
| 1 hectare (ha) = 2.5 acres                                  |
| <b>Volume (dry)</b>                                         |
| 1 cubic centimetre (cm <sup>3</sup> ) = 0.061 cubic inches  |
| 1 cubic metre (m <sup>3</sup> ) = 1.31 cubic yards          |
| 1 cubic metre (m <sup>3</sup> ) = 35.31 cubic feet          |
| 1,000 cubic metres (m <sup>3</sup> ) = 0.81 acre-feet       |
| 1 hectolitre (hL) = 2.8 bushels                             |
| <b>Volume (liquid)</b>                                      |
| 1 millilitre (mL) = 0.035 fluid ounces (Imp.)               |
| 1 litre (L) = 1.76 pints (Imp.)                             |
| 1 litre (L) = 0.88 quarts (Imp.)                            |
| 1 litre (L) = 0.22 gallons (Imp.)                           |
| 1 litre (L) = 0.26 gallons (U.S.)                           |
| <b>Weight</b>                                               |
| 1 gram (g) = 0.035 ounces                                   |
| 1 kilogram (kg) = 2.21 pounds                               |
| 1 tonne (t) = 1.10 short tons                               |
| 1 tonne (t) = 2,205 pounds                                  |
| <b>Pressure</b>                                             |
| 1 kilopascal (kPa) = 0.15 pounds/in. <sup>2</sup>           |
| <b>Speed</b>                                                |
| 1 metre per second = 3.28 feet per second                   |
| 1 metre per second = 2.24 miles per hour                    |
| 1 kilometre per hour = 0.62 miles per hour                  |
| <b>Temperature</b>                                          |
| °F = (°C × 9/5) + 32                                        |

**Conversion tables – imperial to metric (approximate)**

|                                     |
|-------------------------------------|
| <b>Length</b>                       |
| 1 inch = 2.54 cm                    |
| 1 foot = 0.30 m                     |
| 1 yard = 0.91 m                     |
| 1 mile = 1.61 km                    |
| <b>Area</b>                         |
| 1 square foot = 0.09 m <sup>2</sup> |
| 1 square yard = 0.84 m <sup>2</sup> |
| 1 acre = 0.40 ha                    |
| <b>Volume (dry)</b>                 |
| 1 cubic yard = 0.76 m <sup>3</sup>  |
| 1 bushel = 36.37 L                  |
| <b>Volume (liquid)</b>              |
| 1 fluid ounce (Imp.) = 28.41 mL     |
| 1 pint (Imp.) = 0.57 L              |
| 1 gallon (Imp.) = 4.55 L            |
| 1 gallon (U.S.) = 3.79 L            |
| <b>Weight</b>                       |
| 1 ounce = 28.35 g                   |
| 1 pound = 453.6 g                   |
| 1 ton = 0.91 tonne                  |
| <b>Pressure</b>                     |
| 1 pound per square inch = 6.90 kPa  |
| <b>Temperature</b>                  |
| °C = (°F – 32) × 5/9                |

**Abbreviations**

|                 |                              |
|-----------------|------------------------------|
| %               | = per cent                   |
| ai              | = active ingredient          |
| AP              | = agricultural powder        |
| cm              | = centimetre                 |
| cm <sup>2</sup> | = square centimetre          |
| CS              | = capsule suspension         |
| DF              | = dry flowable               |
| DG              | = dispersible granular       |
| DP              | = dispersible powder         |
| E               | = emulsifiable               |
| EC              | = electrical conductivity    |
| e.g.            | = for example                |
| F               | = flowable                   |
| g               | = gram                       |
| Gr              | = granules, granular         |
| ha              | = hectare                    |
| kg              | = kilogram                   |
| km/h            | = kilometres per hour        |
| kPa             | = kilopascal                 |
| L               | = litre                      |
| m               | = metre                      |
| m <sup>2</sup>  | = square metre               |
| mL              | = millilitre                 |
| mm              | = millimetre                 |
| m/s             | = metres per second          |
| SC              | = sprayable concentrate      |
| SP              | = soluble powder             |
| t               | = tonne                      |
| W               | = wettable (powder)          |
| WDG             | = water dispersible granular |
| WG              | = wettable granule           |
| WP              | = wettable powder            |

**Appendix J.**  
Field Record Form

|                                                 |                   |          |          |          |                   |          |          |          |                   |          |          |          |                   |          |          |          |
|-------------------------------------------------|-------------------|----------|----------|----------|-------------------|----------|----------|----------|-------------------|----------|----------|----------|-------------------|----------|----------|----------|
| <b>YEAR</b> _____                               |                   |          |          |          |                   |          |          |          |                   |          |          |          |                   |          |          |          |
|                                                 | <b>Field I.D.</b> |          |          |          | <b>Field I.D.</b> |          |          |          | <b>Field I.D.</b> |          |          |          | <b>Field I.D.</b> |          |          |          |
| <b>Acreage</b>                                  |                   |          |          |          |                   |          |          |          |                   |          |          |          |                   |          |          |          |
| <b>Soil Type</b>                                |                   |          |          |          |                   |          |          |          |                   |          |          |          |                   |          |          |          |
| <b>Soil Fertility</b>                           | <b>pH</b>         | <b>N</b> | <b>P</b> | <b>K</b> | <b>pH</b>         | <b>N</b> | <b>P</b> | <b>K</b> | <b>pH</b>         | <b>N</b> | <b>P</b> | <b>K</b> | <b>pH</b>         | <b>N</b> | <b>P</b> | <b>K</b> |
|                                                 |                   |          |          |          |                   |          |          |          |                   |          |          |          |                   |          |          |          |
| <b>Tillage</b>                                  |                   |          |          |          |                   |          |          |          |                   |          |          |          |                   |          |          |          |
| <b>Variety/Hybrid</b>                           |                   |          |          |          |                   |          |          |          |                   |          |          |          |                   |          |          |          |
| <b>Seeding Rate</b>                             |                   |          |          |          |                   |          |          |          |                   |          |          |          |                   |          |          |          |
| <b>Seeding Date</b>                             |                   |          |          |          |                   |          |          |          |                   |          |          |          |                   |          |          |          |
| <b>Seed Treatment</b>                           |                   |          |          |          |                   |          |          |          |                   |          |          |          |                   |          |          |          |
| <b>Fertilizer/Lime</b><br>product, rate, timing |                   |          |          |          |                   |          |          |          |                   |          |          |          |                   |          |          |          |
| <b>Manure Application</b>                       |                   |          |          |          |                   |          |          |          |                   |          |          |          |                   |          |          |          |
| <b>Herbicides</b>                               |                   |          |          |          |                   |          |          |          |                   |          |          |          |                   |          |          |          |
| Rate                                            |                   |          |          |          |                   |          |          |          |                   |          |          |          |                   |          |          |          |
| Crop Stage                                      |                   |          |          |          |                   |          |          |          |                   |          |          |          |                   |          |          |          |
| Date                                            |                   |          |          |          |                   |          |          |          |                   |          |          |          |                   |          |          |          |
| <b>Yield</b>                                    |                   |          |          |          |                   |          |          |          |                   |          |          |          |                   |          |          |          |
| Harvest Date                                    |                   |          |          |          |                   |          |          |          |                   |          |          |          |                   |          |          |          |
| Moisture                                        |                   |          |          |          |                   |          |          |          |                   |          |          |          |                   |          |          |          |
| Test Wt/Grade                                   |                   |          |          |          |                   |          |          |          |                   |          |          |          |                   |          |          |          |
| <b>Notes</b>                                    |                   |          |          |          |                   |          |          |          |                   |          |          |          |                   |          |          |          |

**Appendix K.**  
Field Scouting Report

Farm: \_\_\_\_\_ Scout: \_\_\_\_\_ Date: \_\_\_\_\_ Time: \_\_\_\_\_

Field: \_\_\_\_\_ Acreage: \_\_\_\_\_ Crop: \_\_\_\_\_ Plant Population: \_\_\_\_\_

Crop Growth Stage, Height and Condition: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Soil Condition: \_\_\_\_\_

| Weeds | Growth Stage | Pressure/Density |
|-------|--------------|------------------|
|       |              |                  |
|       |              |                  |
|       |              |                  |
|       |              |                  |
|       |              |                  |
|       |              |                  |
|       |              |                  |
|       |              |                  |
|       |              |                  |
|       |              |                  |

| Insects | Stage | Pressure/Density |
|---------|-------|------------------|
|         |       |                  |
|         |       |                  |
|         |       |                  |
|         |       |                  |
|         |       |                  |

| Diseases | Stage | Pressure/Density |
|----------|-------|------------------|
|          |       |                  |
|          |       |                  |
|          |       |                  |
|          |       |                  |
|          |       |                  |

**Field Map:** Use the blank area below to sketch in the location of weeds, insects, disease patches, crop condition, including GPS coordinates.

**Field Scout's Comments:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**Action Recommended:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



# Emergency and First-Aid Procedures for Pesticide Poisoning

For pesticide poisonings and pesticide injuries, call the Poison Information Centre:

Toronto 1-800-268-9017  
1-877-750-2233 (TTY)

## PREVENT ACCIDENTS

- **Read the label.** Follow all the precautions the label recommends. Read the First Aid section of the label **BEFORE** you begin to handle any pesticide.
- **Make sure that someone knows** what pesticides you are working with and where you are.
- **Keep a file of labels and product Material Safety Data Sheets (MSDS) for the pesticides you use.** Make sure everyone knows where to find this in case of an emergency.
- **Post emergency numbers near all telephones.**
- **Keep clean water, paper towels, extra gloves and clean coveralls close by** in case you spill pesticide on yourself.

**If someone has been working with pesticides and you see any possible symptoms of pesticide poisoning or injury, take emergency action immediately.**

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## IF AN ACCIDENT OR POISONING HAPPENS

- Protect yourself from injury first.
- Stop the exposure to the pesticide. Move the victim away from the contaminated area.
- Check the four basic facts — identify the pesticide, the quantity, the route of entry and time of exposure.
- Call an ambulance or the Poison Information Centre.
- Start first aid. This is not a substitute for professional medical help.
- **Provide the label, MSDS sheet or container to emergency personnel** at the scene — or take it with you to the hospital. Do not transport pesticide containers in the passenger compartment of the vehicle.

## FIRST AID

### If a pesticide comes in contact with skin:

- remove all contaminated clothing; wash skin thoroughly with lots of soap and warm water
- dry skin well and cover with clean clothing or other clean material.

### If pesticide comes in contact with eyes:

- hold eyelids open; wash the eyes with clean running water for 15 minutes or more.

### If pesticide was inhaled:

- move the victim to fresh air and loosen tight clothing
- give artificial respiration if the victim is not breathing

**Do not breathe in the exhaled air from the victim — you could also be poisoned.**

### If a pesticide was swallowed:

- call the Poison Information Centre **IMMEDIATELY**.

**Emergency numbers are listed at the front of each Bell telephone directory.**

To obtain copies of this or any other OMAFRA publication, please order:

- online at [ontario.ca/publications](http://ontario.ca/publications)
- by phone through the ServiceOntario Contact Centre, Monday to Friday, 8:30 AM to 5:00 PM ET
  - 416-326-5300
  - 416-326-3408 (TTY)
  - 1-800-668-9938, toll-free across Canada
  - 1-800-368-7095 (TTY), toll-free across Ontario
- in person at ServiceOntario Centres across Ontario

## For a major spill, a theft or a fire involving a pesticide:

Call the Ministry of the Environment and Climate Change Spills Action Centre at  
1-800-268-6060 (24 hr a day, 7 days a week).  
Notify your municipality.

