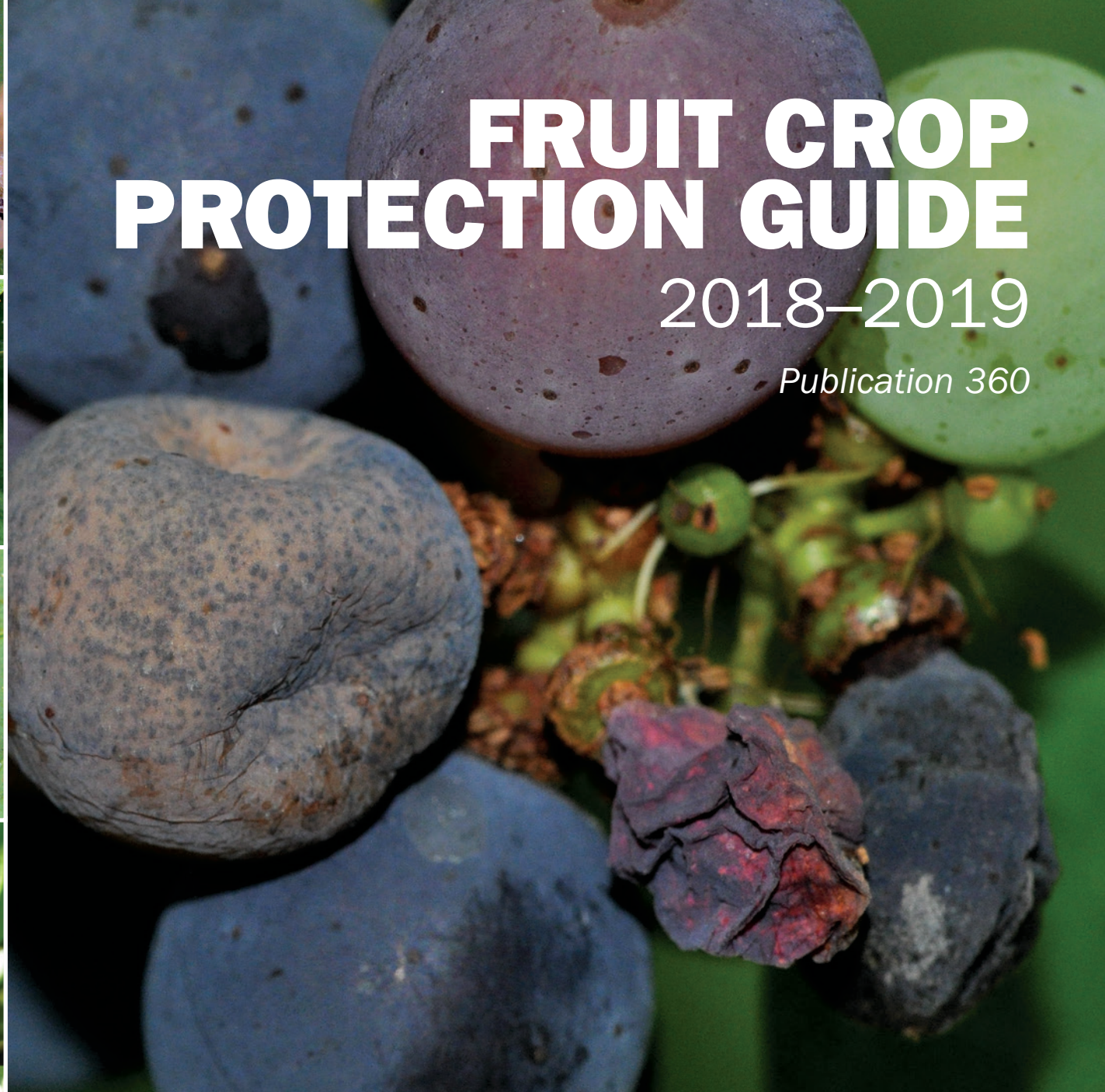


FRUIT CROP PROTECTION GUIDE

2018–2019

Publication 360



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 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.

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, re-strictions on use, compatibility with other products, the effect of environmental conditions, etc.

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

Registration of Pesticide Products

The Pest Management Regulatory Agency (PMRA) of Health Canada registers pesticide products for use in Canada following an evaluation of scientific data to ensure that the product has merit and 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.

Maximum Residue Limits

The PMRA has established maximum residue limits (MRLs) for pesticides. Processors or retailers may demand more restrictive limits. Growers should seek 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.

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 PMRA's Pest Management Information Service.

For more information on the federal registration status, search Pest Management Regulatory Agency at www.canada.ca or call 1-800-267-6315.

Regulation of Pesticides in Ontario

The MOECC is responsible for regulating pesticide sale, use, transportation, storage and disposal in Ontario. Ontario regulates pesticides by plac-ing 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 or by calling the ServiceOntario Publications Toll-Free number: 1-800-668-9938 or 416-326-5300.

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.

Certification and Licensing

Growers and Their Assistants

For information about certification for growers and training for assistants, check the Ontario Pesticide Education Program website: www.opecp.ca or call 1-800-652-8573.

Commercial Applicators (Exterminators) and Their Assisting Technicians

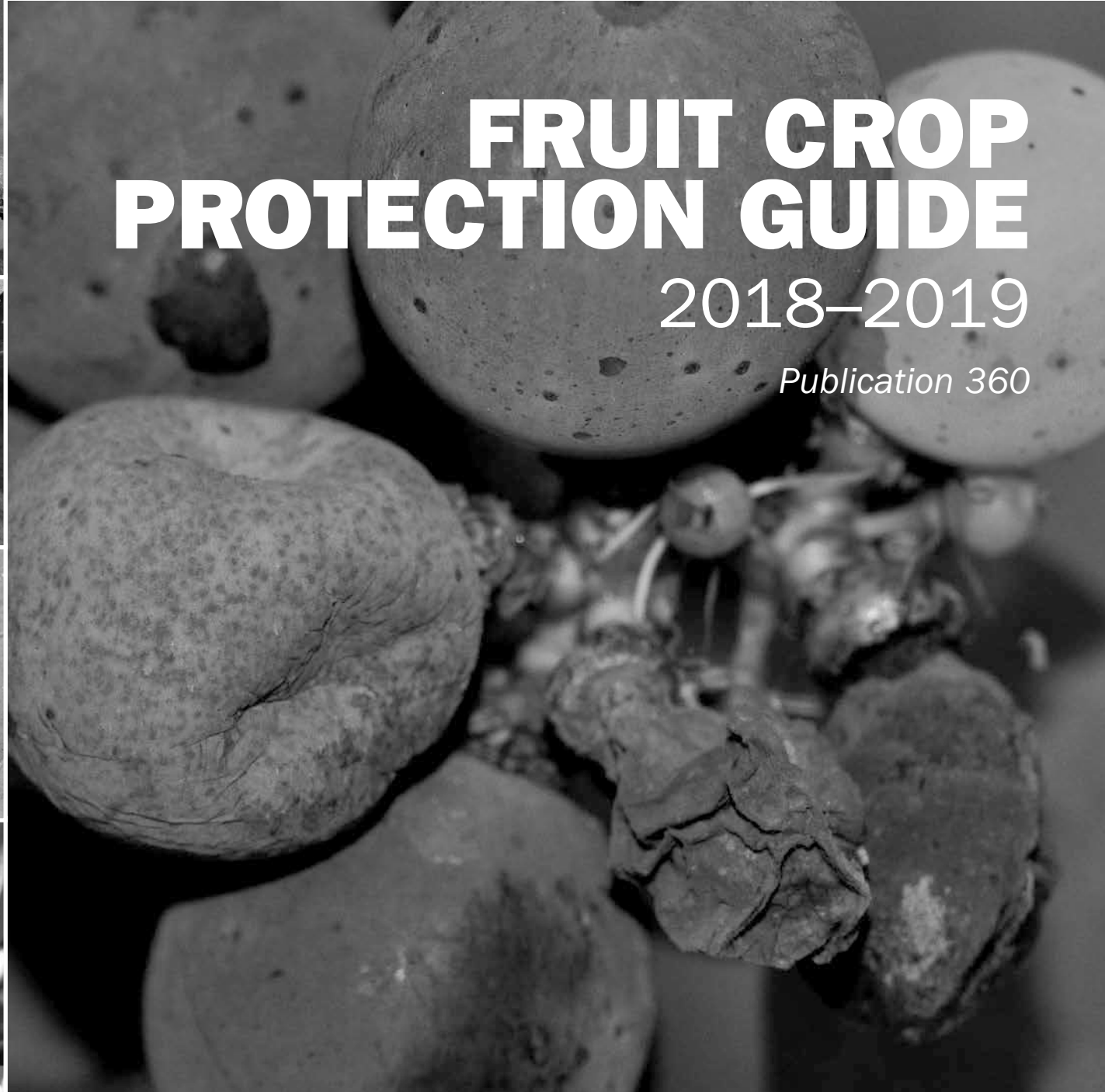
For more information about exterminator licensing and technician training, visit:

- the Ontario Pesticide Training and Certification website at <https://www.ontariopesticide.com/> or call 1-888-620-9999 or 519-674-1575
- the Pesticide Industry Council's Pesticide Technician Program website at www.hort-trades.com or call 1-800-265-5656 or e-mail pic@hort-trades.com
- the Pesticide Industry Regulatory Council (PIRC) at www.oipma.ca

FRUIT CROP PROTECTION GUIDE

2018–2019

Publication 360



If you need technical or business information, contact the Agricultural Information Contact Centre at
1-877-424-1300
ag.info.omafra@ontario.ca

Looking for fruit production information on the Internet?
Check the OMAFRA website at
ontario.ca/crops

This publication contains pesticide control products that have been registered as of October 31, 2017, on fruit crops.
Any supplements to this publication will be posted on the OMAFRA website at ontario.ca/crops

Acknowledgements

The information contained in this publication has been prepared in consultation with:

- Ontario Pest Management Services Committee
- Ontario Pesticide Education Program
- Ontario Soil Management Services Committee

and personnel of:

- Agriculture Development Branch, OMAFRA
- CropLife Canada
- University of Guelph
- Brock University CCOVI
- Ontario Ministry of Environment and Climate Change
- Agriculture and Agri-Food Canada
- Several private consulting businesses

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1. Using Pesticides in Ontario

The information in this chapter is updated regularly. For up-to-date information, visit 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 at
www.opep.ca/resources.

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 Government of Canada website at www.canada.ca. 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 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.

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 or call 1-800-652-8573.

Class 12 Requirements for Growers

Starting on July 1, 2015, new requirements were 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, 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 <https://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 or call 1-800-265-5656 or e-mail pic@hort-trades.com
- the Pesticide Industry Regulatory Council (PIRC) at 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 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 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: search “Pest Management Regulatory Agency” at www.canada.ca
- 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
- Regional MOECC Pesticides Specialist (See Appendix H: *Ontario Ministry of the Environment and Climate Change – Regional Contact Information*)
- Ministry of Agriculture, Food and Rural Affairs (OMAFRA) website: ontario.ca/omafra
- Ontario Pesticide Education Program (University of Guelph, Ridgetown Campus) website: www.opep.ca
- Ontario Pesticide Training & Certification website: <https://www.ontariopesticide.com>
- Pesticide Industry Council’s Pesticide Technician Program website at www.horttrades.com/pesticide-technician
- IPM Council of Canada website: www.ontarioipm.com or www.ipmcouncilcanada.org
- Pesticide Industry Regulatory Council (PIRC) at 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
- OMAFRA Factsheet *Pesticide Drift from Ground Applications*
- Ontario Pesticide Education Program (University of Guelph, Ridgetown Campus) videos at www.opep.ca/resources (click the 'YouTube' icon)
- 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 1–1 for an example of a 24-hr REI on a pesticide label.

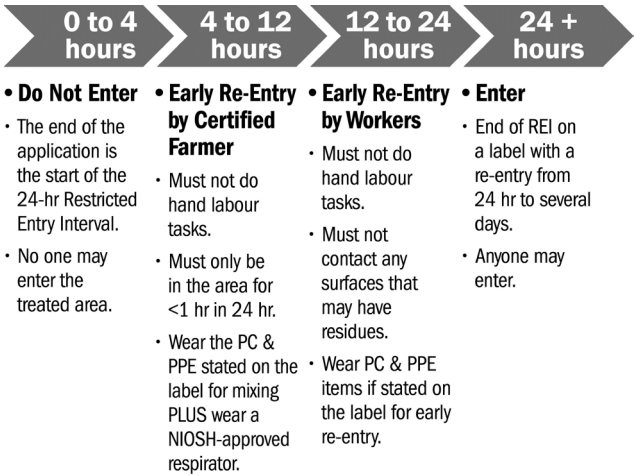


Figure 1–1. Example of a 24-hr REI on a pesticide label

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, search Buffer Zone Calculator at www.canada.ca.

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:

- 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 p.m. 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 a.m. 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, search Pollinator Protection and Responsible Use of Treated Seed – Best Management Practices at www.canada.ca.
- 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, stopping spraying until conditions improve or, if possible, moving to another field where wind conditions are acceptable for spraying.
- 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
- OMAFRA website: 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) 'Drift of Pesticides' video series, available at www.opep.ca/resources (click the 'YouTube' icon)

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, call your local dealer or contact CleanFARMS at 416-622-4460 (toll-free at 1-877-622-4460) or 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.

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.

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), contact CleanFARMS at 416-622-4460 (toll free at 877-622-4460) or 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 1–1, the storage requirements that must be followed are dependent on which classes of pesticides you store.

Table 1–1. 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 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/resources.

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 (for Ontario legislation) and 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/resources.

**For pesticide poisonings and pesticide injuries, call:
Poison Information Centre: 1-800-268-9017**

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

APPLE CALENDAR

In this section:

- Read the product label and follow all safety precautions. 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>.
- Unless specified on the product label, use enough water to ensure thorough spray coverage. Where the product rate is listed in amount per 1,000 L, or if a water volume is not provided on the label, use enough water to wet the foliage to the near drip point.
- For preharvest interval, restricted entry interval, and maximum number of applications, see Table 2–1. *Products Used on Apples*, page 64.
- **Products are listed by chemical group and in alphabetical order within each group. The order does not reflect efficacy.** See Table 2–2. *Activity of Insecticides and Miticides on Apple Pests*, page 70 and Table 2–3. *Activity of Fungicides on Apple Diseases*, page 75, for efficacy ratings.
- Where a product in the calendar is followed by a “*”, it is potentially acceptable for organic use based on *Ministère de l’Agriculture, des Pêcheries et de l’Alimentation du Québec publication Bulletin D’Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with your certifying body to verify the acceptability of any product prior to using it.
- Information on the timing and rates of application for plant growth regulators and chemical thinners can be found in the crop calendars. For additional information on plant growth regulators and thinning, visit ontario.ca/apples and click on *Plant Growth Regulators for Fruit Crops* and *Thinning of Tree Fruit*.

Resistance Management

To delay development of resistance to fungicides, insecticides and miticides, follow resistance management guidelines outlined in *Resistance Management Strategies*, page 393. The chemical group is indicated in the column labelled “Group” before the “Product” column. Products belonging to the same chemical group are grouped together in the calendar. Multi-site (M) fungicides are not prone to resistance and do not have to be rotated. Some products are not classified to mode of action (NC) and the mode of action has not been determined for others (U or UN).

Fungicide resistance management

Take the following steps to avoid rapid development of fungicide resistance:

- Do not reduce rates below those specified on the label.
- Do not use products containing the same chemical group in consecutive applications.
- Use products containing only one chemical family no more than twice per season.
- Use co-formulations or products that must be tank-mixed with another chemical group no more than 3 times per season.
- Use sufficient water to provide thorough coverage.
- Do not use Fullback, Nova, Inspire Super, Aprovia Top, Fontelis, Kenja, Sercadis, Luna Tranquility, Pristine, Scala, Sovran, or Flint when sporulating lesions of the target disease are present.

Insecticide Resistance Management

Take the following steps to avoid development of insecticide resistance:

- For pests with discrete generations (codling moth, oriental fruit moth), do not use insecticides from the same group for more than one generation. Within a generation, if more than one spray is required, use a product from the same chemical group.
- For pests with rapidly building and overlapping generations (mites, aphids), do not use products containing the same chemical group in consecutive applications.

Bee Toxicity

Some insecticides are toxic to bees and other pollinating insects. Use of insecticides on flowering crops requires careful management to avoid negative effects on pollinators. Some insecticides cannot be applied prior to bloom. Insecticides should not be applied when tree fruit are in bloom. Do not apply insecticides when bees are active. Before and after bloom, bees may be present on flowering cover crops and weeds—do not allow drift of insecticides onto these or other flowering crops. Always follow label precautions to avoid impacts on bees. For more information, see *Bee Poisoning*, page 5, and honeybee toxicity ratings in Table 2–4. *Toxicity of Pesticides to Honeybees and Mite/Aphid Predators*, page 77.

Buffer Zones

Leave a suitable buffer zone between treatment area and adjacent sensitive areas, such as hedgerows, woodlots and freshwater habitats. Zones may vary depending on the product used, growth stage of the crop and method of application, including the use of drift-reducing technology. Check the pesticide label for requirements.

Use Health Canada’s online spray drift calculator to modify the buffer zone specified on the label based on weather conditions, category of spray equipment and 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. Unfortunately, this model does not account for carrier volume, travel speed or crop stage.

Observing buffer zones is a legal requirement. A record of the buffer zone modification, if any, must be retained for at least one year from the time of application.

Crop Nutrition

Crop nutrition is important for plant growth, fruit quality development and the acquisition of adequate cold hardiness by tree fruit. For fruit crops, soil testing, plant tissue analysis and visual deficiency symptoms all play an important role in assessing and monitoring the crop's nutritional status. For more information, visit ontario.ca/apples (click on *Soil Management, Fertilizer Use, Crop Nutrition and Cover Crops for Fruit Production*) and see OMAFRA Publication 611, *Soil Fertility Handbook*. For soil testing and plant tissue analysis services, see Appendix E: *Accredited Soil-Testing Laboratories in Ontario*, page 435.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Dormant to bud swell						
Scale	General Comments: • May cause bark injury on Red Delicious, Empire, Mutsu/Crispin and Ambrosia. • Apply in a high-volume spray to ensure thorough coverage of trunk and limbs. • Do not apply within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain and to heat- or moisture-stressed trees. • Do not use within 14 days of Supra Captan, Maestro or Folpan.					
	NC	Purespray Green Spray Oil 13 E *	20 L/1,000 L water	12 hours	—	In addition to precautions in general comments, do not use within 14 days of Ambush, Perm-Up, Pounce or sulphur.
		Superior 70 Oil *	20 L/1,000 L water	12 hours	—	In addition to precautions in general comments, do not use within 30 days of sulphur.
		Vegol Crop Oil *	20 L/1,000 L water	12 hours	0 days	In addition to precautions in general comments, do not use within 14 days of copper and 30 days of sulphur. Do not apply to wet foliage.
Fire blight	M	Copper Spray *	3.2 kg/ha	48 hours	2 days	These products are contact fungicides only and do not have activity on the fire blight pathogen within the plant tissue. Apply when overwintering cankers begin to ooze as tree breaks dormancy. Apply up to ¼-inch green. Phytotoxicity may occur with some copper formulations if applied at a later growth stage. Read label for more information. Thorough coverage of limbs and trunk is essential for good control. This spray does not eliminate the need for blossom blight management.
		Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	
Tree growth modification	NC	Promalin SL	100–166 mL/500 mL latex paint	12 hours	28 days	Mix with latex paint and apply directly to buds with a brush or sponge uniformly covering bark surface. Apply to 1-year-old wood only. Apply when terminal buds have started to swell, but before bud break as this may result in injury to tender side shoot tips. Notching bark above the bud with a hacksaw blade prior to treatment will greatly increase efficacy. Do not use when temperatures are below freezing, above 30°C or if rain is forecast within 6 hours. Visit ontario.ca/apples and click on <i>Plant Growth Regulators for Fruit Crops</i> .

¹ General re-entry. ² Hand thinning. ³ Contact and scouting activities. ⁴ Hand harvest. ⁵ Pick-your-own harvest. ⁶ Apply no later than 14 days after petal fall. ⁷ General re-entry in traditional low- to medium-density orchards. ⁸ General re-entry in high-density, trellised orchards. ⁹ Hand thinning and managing hand-line irrigation in traditional low- to medium-density orchards.

¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

* Potentially organic. Check with certifying body.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Green tip to half-inch green						
Scab General Comments: - Apply fungicides before spore release as soon as green tissue is present and keep growing leaves covered if conditions are conducive to disease development. See ontario.ca/cropipm for information on infection periods. - For resistance management, use a maximum of 2 applications of products per fungicide group from Group 3 and 7 per season.						
M	Cueva		1% v/v in 470–940 L water/ha	4 hours	1 day	May cause russetting of light-skinned cultivars. If concerned about sensitivity of fruit, test first on a small area.
		Dithane Rainshield or Manzate Pro-Stick or Penncozeb 75 Raincoat	2 kg/1,000 L water 6 kg/ha 2 kg/1,000 L water	12 hours 24 hours 24 hours	45 days	No product specific comments.
		Folpan 80 WDG	3.0–3.75 kg/ha	24 hours	—	May cause russetting to Delicious and other sensitive cultivars when used pink to 30 days after petal fall. Do not use within 14 days of oil.
		Granuflo-T	1.5–2.25 kg/1,000 L water	24 hours	28 days	No product specific comments.
		Maestro 80 DF or Supra Captan 80 WDG	3.75 kg/ha	48 hours	7 days	Do not use within 14 days of oil or as a tank-mix or sequential application with products containing oil such as Fontelis or Exirel.
		Polyram DF	6 kg/ha	12 hours	45 days	No product specific comments.
	1	Senator 50 SC plus 1/2 to full rate Group M	250 mL/1,000 L water See Group M above	12 hours	1 day	Historically, Benlate-resistant forms of apple scab have been present in Ontario. Senator belongs to the same chemical group as Benlate. Use caution if Benlate was used in your orchard in the past. For resistance management, tank-mix with a compatible protectant scab fungicide from a different group. See label for more information on suggested tank-mix partners.
	3+7	Aprovia Top 195 EC	386–643 mL/ha	12 hours	30 days	In conditions of rapid growth or high disease pressure, use high rate and shorten intervals between applications. For resistance management, tank-mix with a compatible protectant apple scab fungicide from a different group. See labels for suggested tank-mix partners.
	7	Fontelis	1.0–1.5 L/ha	12 hours	28 days	In conditions of rapid growth or high disease pressure, use high rate and shorten intervals between applications. For resistance management, tank-mix with a compatible protectant apple scab fungicide from a different group. See labels for suggested tank-mix partners. Fontelis contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions. Use Sercadis with a non-ionic surfactant at a rate of 0.125% v/v (1.25 L in 1,000 L water). See Table 2–8. <i>Adjuvants Used in Ontario</i> , page 85.
		Kenja 400 SC	913 mL/ha	12 hours	20 days	
		Sercadis	333 mL/ha	12 hours	0 days	

¹ General re-entry. ² Hand thinning. ³ Contact and scouting activities. ⁴ Hand harvest. ⁵ Pick-your-own harvest. ⁶ Apply no later than 14 days after petal fall. ⁷ General re-entry in traditional low- to medium-density orchards. ⁸ General re-entry in high-density, trellised orchards. ⁹ Hand thinning and managing hand-line irrigation in traditional low- to medium-density orchards.

¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

* Potentially organic. Check with certifying body.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Green tip to half-inch green						
Scab (cont'd)	7+9	Luna Tranquility plus 1/2 to full rate Group M	800 mL/ha See Group M above	12 hours ¹ / 24 hours ²	14 days	In conditions of rapid growth or high disease pressure, shorten intervals between applications.
	9	Scala SC	1 L/ha	12 hours ¹ / 24 hours ²	14 days	This product does not control other diseases. Maximum of 2 applications per season, prebloom only.
	29	Allegro 500 F	0.5–1.0 L/ha	24 hours ¹ / 72 hours ²	28 days	In orchards with high disease pressure or susceptible cultivars, use high rate. Do not mix with oil. May provide mite suppression.
	44	Serenade OPTI *	1.7–3.3 kg/ha	when dry	0 days	Suppression only. Apply preventatively at 7–10-day intervals. Use in conjunction with other cultural or chemical controls.
	NC	Buran *	1.8% v/v (ie., 9 L in 500 L water/ha)	when dry	0 days	Suppression only. Do not use more than 18 L/ha per application. This product should only be used as a post-infection treatment, but before 350 degree-hours (base 0°C) after beginning of infection. Apply after rainfall or when conditions are conducive to disease development. Do not apply if rain is forecast within 48 hours.
	U12	Syllit 400 FL plus 1/2 to full rate Group M	1.75 L/ha See Group M above	48 hours	7 days	Resistance is present in some Ontario orchards. Check the status of resistance to U12 fungicides in your orchard before using it. See <i>Managing Resistance to Fungicides</i> , page 394. For resistance management, tank-mix with a compatible protectant scab fungicide from a different group. See label for more information on suggested tank-mix partners. Do not use after Tight cluster .
Powdery mildew	General Comments: - Apply fungicides beginning at Green tip and continue to First summer spray. Additional sprays beyond First summer spray may be needed on susceptible cultivars or if disease pressure is severe. - For resistance management, use a maximum of 2 applications of products per fungicide group from Group 3, 7 and 11 per season.					
	M	Cosavet DF Edge * or Kumulus DF * or Microscopic Sulphur WP * or Microthiol Disperss *	22.5 kg/ha 22.5 kg/ha 6.5 kg/1,000 L water 22.5 kg/ha	24 hours	1 day	May cause an increase in red mite and scale populations. Do not use within 14 days of Purespray Green Spray Oil and 30 days of Vegol Crop Oil or Superior Oil.
	1	Senator 50 SC	250 mL/1,000 L water	12 hours	1 day	No product specific comments.
	3	Fullback 125 SC	585–877 mL/ha	12 hours	14 days	No product specific comments.
		Nova	340 g/ha	12 hours ^{1,3} / 5 days ⁴ / 12 days ²	14 days	No product specific comments.

¹ General re-entry. ² Hand thinning. ³ Contact and scouting activities. ⁴ Hand harvest. ⁵ Pick-your-own harvest. ⁶ Apply no later than 14 days after petal fall. ⁷ General re-entry in traditional low- to medium-density orchards. ⁸ General re-entry in high-density, trellised orchards. ⁹ Hand thinning and managing hand-line irrigation in traditional low- to medium-density orchards.

¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

* Potentially organic. Check with certifying body.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Green tip to half-inch green						
Powdery mildew (cont'd)	3+7	Aprovia Top 195 EC	643 mL/ha	12 hours	30 days	No product specific comments.
	3+9	Inspire Super	836 mL/ha	12 hours	14 days	Suppression only.
	7	Fontelis	1.0–1.5 L/ha	12 hours	28 days	Contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
		Sercadis	167–333 mL/ha	12 hours	0 days	Use with a non-ionic surfactant at a rate of 0.125% v/v (1.25 L in 1,000 L water). See Table 2–8. <i>Adjuvants Used in Ontario</i> , page 85.
	7+9	Luna Tranquility	600 mL/ha	12 hours ¹ / 24 hours ²	14 days	No product specific comments.
	7+11	Pristine WG	1.0–1.2 kg/ha	when dry ¹ / 5 days ⁴ / 12 days ²	5 days	Do not tank-mix or make sequential applications with Exirel.
	11	Flint	140–210 g/ha	12 hours ¹ / 4 days ²	14 days	Do not tank-mix or make sequential applications with Exirel.
		Sovran	240 g/ha	48 hours	30 days	
	44	Serenade OPTI *	1.7–3.3 kg/ha	when dry	0 days	Suppression only. Apply preventatively at 7–10-day intervals. Use in conjunction with other cultural or chemical controls.
	NC	Buran *	9 L/ha	when dry	0 days	Suppression only. Control can be achieved under low to moderate disease pressure with addition of a non-ionic surfactant at a rate of 0.1% v/v. See Table 2–8. <i>Adjuvants Used in Ontario</i> , page 85. Apply in 500–800 L water/ha. Begin applications preventatively when conditions are conducive to disease development. Reapply every 7–10 days if needed. Do not apply if rain is forecast within 48 hours.
		Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	Suppression only. May cause bark injury on Red Delicious, Empire, Mutsu/Crispin and Ambrosia. Apply in a high-volume spray to ensure thorough coverage. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of Supra Captan, Maestro, Folpan, Ambush, Perm-Up, Pounce or sulphur.
		Vegol Crop Oil *	2% v/v	12 hours	0 days	Suppression only. May cause bark injury on Red Delicious, Empire, Mutsu/Crispin and Ambrosia. Apply in a high-volume spray to ensure thorough coverage at a rate of 2% v/v (20 L/1,000 L water). Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of Supra Captan, Maestro, Folpan or copper and 30 days of sulphur. Do not apply to wet foliage.

¹ General re-entry. ² Hand thinning. ³ Contact and scouting activities. ⁴ Hand harvest. ⁵ Pick-your-own harvest. ⁶ Apply no later than 14 days after petal fall. ⁷ General re-entry in traditional low- to medium-density orchards. ⁸ General re-entry in high-density, trellised orchards. ⁹ Hand thinning and managing hand-line irrigation in traditional low- to medium-density orchards.

¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

* Potentially organic. Check with certifying body.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Half-inch green to tight cluster						
European red mite	General Comments: - Oil may cause bark injury on Red Delicious, Empire, Mutsu/Crispin and Ambrosia. - Apply in a high-volume spray to ensure thorough coverage of trunk and limbs. - Apply before overwintering eggs hatch. - Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain and to heat- or moisture-stressed trees. - Do not use within 14 days of Supra Captan, Maestro or Folpan.					
	NC	Purespray Green Spray Oil 13 *	20 L/1,000 L water	12 hours	—	Suppression only. In addition to precautions in general comments, do not use within 14 days of Ambush, Perm-Up, Pounce or sulphur.
		Superior 70 Oil *	20 L/1,000 L water	12 hours	—	In addition to precautions in general comments, do not use within 30 days of sulphur.
		Vegol Crop Oil *	20 L/1,000 L water	12 hours	0 days	In addition to precautions in general comments, do not use within 14 days of copper and 30 days of sulphur. Do not apply to wet foliage.
Rosy apple aphid	General Comments: Spray if 20 or more clusters in a 100-cluster sample are infested.					
	4A	Actara 25 WG	160 g/ha	12 hours	60 days	Maximum of 2 applications of products from this group per season. Repeated use may result in mite outbreaks. Maximum 1 prebloom application of Actara.
		Assail 70 WP	120 g/ha	12 hours ¹ / 48 hours ³ / 6 days ²	7 days	
		Calypso 480 SC	145–290 mL/ha	12 hours	30 days	
	4C	Closer	100–200 mL/ha	12 hours	7 days	Where possible, rotate with products outside of Group 4.
	4C+5	TwinGuard	250 g/ha	12 hours	7 days	Where possible, rotate with products outside of Group 4.
	4D	Sivanto Prime	500–750 mL/ha	12 hours	14 days	Where possible, rotate with products outside of Group 4.
	28	Exirel	1.5 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
	29	Beleaf 50 SG	160 g/ha	12 hours ¹ / 48 hours ²	21 days	No product specific comments.
	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	Suppression only. May cause bark injury on Red Delicious, Empire, Mutsu/Crispin and Ambrosia. Apply in a high-volume spray to ensure thorough coverage. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of using Supra Captan, Maestro, Folpan, Ambush, Perm-Up, Pounce or sulphur.

¹ General re-entry. ² Hand thinning. ³ Contact and scouting activities. ⁴ Hand harvest. ⁵ Pick-your-own harvest. ⁶ Apply no later than 14 days after petal fall. ⁷ General re-entry in traditional low- to medium-density orchards. ⁸ General re-entry in high-density, trellised orchards. ⁹ Hand thinning and managing hand-line irrigation in traditional low- to medium-density orchards.

¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

* Potentially organic. Check with certifying body.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Half-inch green to tight cluster						
Rosy apple aphid (cont'd)	NC	Vegol Crop Oil *	2% v/v	12 hours	0 days	May cause bark injury on Red Delicious, Empire, Mutsu/Crispin and Ambrosia. Apply in a high-volume spray to ensure thorough coverage at a rate of 2% v/v (20 L/1,000 L water). Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of Supra Captan, Maestro, Folpan or copper and 30 days of sulphur. Do not apply to wet foliage.
Oriental fruit moth	NC	Isomate OFM TT *	125–250 dispensers/ha	—	—	Reduces mating of oriental fruit moth. Place dispensers in orchard in late April before flight begins. Use high rate for high pressure areas or initial year of treatment. Dispensers are designed to last for the entire season. Supplemental control measures should be applied in orchards with high pest populations. Outbreaks of other pests may occur when insecticides are not used for oriental fruit moth. For information on mating disruption, see OMAFRA Factsheet 03–079, <i>Mating Disruption for Management of Insect Pests</i> .
Scab	General Comments: • Apply fungicides before spore release as soon as green tissue is present and keep growing leaves covered if conditions are conducive to disease development. See ontario.ca/cropIPM for information on infection periods. • For resistance management, use a maximum of 2 applications of products per fungicide group from Group 3, 7 and 11 per season.					
	M	Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	May cause russetting of light-skinned cultivars. If concerned about sensitivity of fruit, test first on a small area.
		Dithane Rainshield or Manzate Pro-stick or Penncozeb 75 Raincoat	2 kg/1,000 L water 6 kg/ha 2 kg/1,000 L water	12 hours 24 hours 24 hours	45 days	No product specific comments.
		Folpan 80 WDG	3.0–3.75 kg/ha	24 hours	—	May cause russetting to Delicious or other sensitive cultivars when used pink to 30 days after petal fall. Do not use within 14 days of oil.
		Granuflo-T	1.5–2.25 kg/1,000 L water	24 hours	28 days	No product specific comments.
	M	Maestro 80 DF or Supra Captan 80 WDG	3.75 kg/ha	48 hours	7 days	Do not use within 14 days of oil or as a tank-mix or sequential applications with products containing oil such as Fontelis or Exirel.
		Polyram DF	6 kg/ha	12 hours	45 days	No product specific comments.
	1	Senator 50 SC plus 1/2 to full rate Group M	250 mL/1,000 L water See Group M above	12 hours	1 day	Historically, Benlate-resistant forms of apple scab have been present in Ontario. Senator belongs to the same chemical group as Benlate. Use caution if Benlate was used in your orchard in the past. For resistance management, tank-mix with a compatible protectant scab fungicide from a different group. See label for more information on suggested tank-mix partners.

¹ General re-entry. ² Hand thinning. ³ Contact and scouting activities. ⁴ Hand harvest. ⁵ Pick-your-own harvest. ⁶ Apply no later than 14 days after petal fall. ⁷ General re-entry in traditional low- to medium-density orchards. ⁸ General re-entry in high-density, trellised orchards. ⁹ Hand thinning and managing hand-line irrigation in traditional low- to medium-density orchards.

¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Half-inch green to tight cluster						
Scab (cont'd)	3	Fullback 125 SC plus 1/2 to full rate Group M	950 mL/ha See Group M above	12 hours	14 days	Resistance to some Group 3 fungicides has been confirmed in Ontario. Check the status of these products before using them in your orchard. See <i>Managing Resistance to Fungicides</i> , page 394. Do not use earlier than Tight cluster . Residues last 5–8 days. In conditions of rapid growth or high disease pressure, shorten intervals between applications. Do not use if apple scab is present.
		Nova plus 1/2 to full rate Group M	340 g/ha See Group M above	12 hours ^{1,3} / 5 days ⁴ / 12 days ²	14 days	
	3+7	Aprovia Top 195 EC	386–643 mL/ha	12 hours	30 days	In conditions of rapid growth or high disease pressure, use high rate and shorten intervals between applications. For resistance management, tank-mix with a compatible protectant apple scab fungicide from a different group. See labels for suggested tank-mix partners. Do not use if apple scab is present.
	3+9	Inspire Super plus 1/2 to full rate Group M	560–836 mL/ha See Group M above	12 hours	14 days	Do not use earlier than Tight cluster . Residues last 5–8 days. In conditions of rapid growth or high disease pressure, shorten intervals between applications. Do not use if apple scab is present. May provide suppression of powdery mildew when applied at high rate.
	7	Fontelis	1.0–1.5 L/ha	12 hours	28 days	In conditions of rapid growth or high disease pressure, use high rate and shorten intervals between applications. For resistance management, tank-mix with a compatible protectant apple scab fungicide from a different group. See labels for suggested tank-mix partners. Do not use if apple scab is present. Fontelis contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions. Use Sercadis with a non-ionic surfactant at a rate of 0.125% v/v (1.25 L in 1,000 L water). See Table 2–8. <i>Adjuvants Used in Ontario</i> , page 85.
		Kenja 400 SC	913 mL/ha	12 hours	20 days	
		Sercadis	333 mL/ha	12 hours	0 days	
	7+9	Luna Tranquility plus 1/2 to full rate Group M	800 mL/ha See Group M above	12 hours ¹ / 24 hours ²	14 days	In conditions of rapid growth or high disease pressure, shorten intervals between applications. Do not use if apple scab is present.
	7+11	Pristine WG plus 1/2 to full rate Group M	1.0–1.2 kg/ha See Group M above	when dry ¹ / 5 days ⁴ / 12 days ²	5 days	Do not use earlier than Tight cluster . Residues last 5–8 days. In conditions of rapid growth and high disease pressure, use high rate and shorten intervals between applications. Do not use if apple scab is present. Do not tank-mix or make sequential applications with Exirel.
	9	Scala SC	1 L/ha	12 hours ¹ / 24 hours ²	14 days	This product does not control other diseases. Maximum of 2 applications per season, prebloom only. Do not use if apple scab is present.

¹ General re-entry. ² Hand thinning. ³ Contact and scouting activities. ⁴ Hand harvest. ⁵ Pick-your-own harvest. ⁶ Apply no later than 14 days after petal fall. ⁷ General re-entry in traditional low- to medium-density orchards. ⁸ General re-entry in high-density, trellised orchards. ⁹ Hand thinning and managing hand-line irrigation in traditional low- to medium-density orchards.

¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Half-inch green to tight cluster						
Scab (cont'd)	11	Flint plus 1/2 to full rate Group M	140 g/ha See Group M above	12 hours ¹ / 4 days ²	14 days	Resistance to some Group 11 fungicides has been confirmed in Ontario. Check the status of these products before using them in your orchard. See <i>Managing Resistance to Fungicides</i> , page 394. Do not use earlier than Tight cluster . Residues last 5–8 days. In conditions of rapid growth and high disease pressure, shorten intervals between applications. Do not use if apple scab is present. Do not tank-mix or make sequential applications with Exirel.
		Sovran plus 1/2 to full rate Group M	240 g/ha See Group M above	48 hours	30 days	
	29	Allegro 500 F	0.5–1.0 L/ha	24 hours ¹ / 72 hours ²	28 days	In orchards with high disease pressure or susceptible cultivars, use high rate. Do not mix with oil. May provide mite suppression.
	44	Serenade OPTI *	1.7–3.3 kg/ha	when dry	0 days	Suppression only. Apply preventatively at 7–10-day intervals. Use in conjunction with other cultural or chemical controls.
	NC	Buran *	1.8% v/v (ie., 9L in 500 L water/ha)	when dry	0 days	Suppression only. Do not use more than 18 L/ha per application. This product should only be used as a post-infection treatment, but before 350 degree-hours (base 0°C) after beginning of infection. Apply after rainfall or when conditions are conducive to disease development. Do not apply if rain is forecast within 48 hours.
	U12	Syllit 400 FL plus 1/2 to full rate Group M	1.75 L/ha See Group M above	48 hours	7 days	Resistance to some Group U12 fungicides has been confirmed in Ontario. Check the status of these products before using them in your orchard. See <i>Managing Resistance to Fungicides</i> , page 394. For resistance management, tank-mix with a compatible protectant scab fungicide from a different group. See label for more information on suggested tank-mix partners. Do not use after Tight cluster .
Powdery mildew	Use one of the products listed for Powdery mildew at Green tip to half-inch green .					
Tight cluster to pink						
Tentiform leafminer	General Comments: • Apply if there are 3 or more eggs per spur or 1 or more sap-feeders per leaf. • Some of these products are toxic to bees. Do not apply when bees are active in the orchard.					
	3	Ambush 500 EC or Perm-Up EC or Pounce 384 EC	400 mL/ha 520 mL/ha 520 mL/ha	when dry	7 days	Apply at first egg hatch. This group is highly toxic to beneficial insects and may lead to mite outbreaks. Maximum of 1 application per season.
		Decis 5 EC	250 mL/ha	12 hours	1 day	
		Mako or Up-Cyde 2.5 EC	400 mL/ha	12 hours	7 days	
		Matador 120 EC or Silencer 120 EC	83 mL/ha	24 hours	7 days	

¹ General re-entry. ² Hand thinning. ³ Contact and scouting activities. ⁴ Hand harvest. ⁵ Pick-your-own harvest. ⁶ Apply no later than 14 days after petal fall. ⁷ General re-entry in traditional low- to medium-density orchards. ⁸ General re-entry in high-density, trellised orchards. ⁹ Hand thinning and managing hand-line irrigation in traditional low- to medium-density orchards.

¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Tight cluster to pink						
Tentiform leafminer (cont'd)	4A	Actara 25 WG	315 g/ha	12 hours	60 days	Apply when population is mainly in the sap-feeder stage. Maximum of 2 applications of product from this group per season. Repeated use may result in mite outbreaks.
		Assail 70 WP	80 g/ha	12 hours ¹ / 48 hours ³ / 6 days ²	7 days	
		Calypso 480 SC	145 mL/ha	12 hours	30 days	
	4C+5	TwinGuard	250–500 g/ha	12 hours	7 days	Apply at egg hatch or at first sign of sap-feeder stage. Where possible, rotate with products outside of Group 4 between generations.
	5	Delegate	420 g/ha	12 hours	7 days	Apply when population is mainly in the sap-feeder stage.
	18	Confirm 240 F	1 L/ha	12 hours	14 days	Apply at first egg hatch. Confirm provides suppression only .
		Intrepid	500 mL/ha	12 hours	14 days	
	28	Altacor	215 g/ha	12 hours	5 days	Apply when population is mainly in the sap-feeder stage. Do not tank-mix or make sequential applications of Exirel with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
		Exirel	500–750 mL/ha	12 hours	3 days	
Plant bugs	3	Ambush 500 EC	400 mL/ha	when dry	7 days	These products are highly toxic to beneficial insects and may lead to mite outbreaks. Do not apply when bees are active in the orchard. Maximum of 1 application per season.
		Mako or Up-Cyde 2.5 EC	400 mL/ha 250 mL/ha	12 hours	7 days	
		Matador 120 EC or Silencer 120 EC	104 mL/ha	24 hours	7 days	
Codling moth, Oriental fruit moth	NC	Isomate-CM/OFM TT *	500 dispensers/ha	—	—	Reduces mating of codling moth and oriental fruit moth. Place pheromone traps for monitoring codling moth in orchard by bloom. Apply dispensers no later than petal fall, before first flight. Dispensers last up to 150 days for codling moth and up to 90 days for oriental fruit moth. For information on mating disruption, see OMAFRA Factsheet 03–079, <i>Mating Disruption for Management of Insect Pests</i> . Most orchards will require insecticides for one or both codling moth generations. Insecticides for oriental fruit moth may be needed in late cultivars where high populations exist.

¹ General re-entry. ² Hand thinning. ³ Contact and scouting activities. ⁴ Hand harvest. ⁵ Pick-your-own harvest. ⁶ Apply no later than 14 days after petal fall. ⁷ General re-entry in traditional low- to medium-density orchards. ⁸ General re-entry in high-density, trellised orchards. ⁹ Hand thinning and managing hand-line irrigation in traditional low- to medium-density orchards.

¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Tight cluster to pink						
Spring-feeding caterpillars	General Comments: Apply if there are 12–15 larvae per 100 terminals.					
	1B	Imidan WP	2.68 kg/ha	7 days ^{1†} / 14 days ⁵ / 30 days ²	14 days	No product specific comments.
	28	Altacor	145–285 g/ha	12 hours	5 days	Reapply, if necessary, 10–14 days later. Use high rate when pest pressure is high.
		Exirel	0.5–1.0 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications of Exirel with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
Scab	Use one of the products listed for Scab at Half-inch green to tight cluster .					
Powdery mildew	Use one of the products listed for Powdery mildew at Green tip to half-inch green .					
Phytophthora crown and root rot	33	Aliette	3–5 kg/ha	when dry	30 days	Apply as foliar spray only. Do not use a drench treatment on bearing trees. Do not use more than 1,000 L/ha. Apply from Tight cluster to pink and again 6 weeks later. Treat again after harvest. Do not tank-mix with copper, adjuvants/surfactants that enhance penetration or foliar fertilizers.
Rust	General Comments: If the alternate host, Eastern red cedar, is nearby, include in sprays up to and including First summer spray.					
	M	Dithane Rainshield or Manzate Pro-stick or Penncozeb 75 Raincoat	2 kg/1,000 L water 6 kg/ha 2 kg/1,000 L water	12 hours 24 hours 24 hours	45 days	No product specific comments.
		Ferbam 76 WDG	1.25–2.0 kg/1,000 L water	12 hours	7 days	May cause russetting on Golden Delicious and other sensitive cultivars.
		Granuflo-T	1.5–2.25 kg/1,000 L water	24 hours	28 days	No product specific comments.
		Polyram DF	6 kg/ha	12 hours	45 days	No product specific comments.
	3	Fullback 125 SC	585–877 mL/ha	12 hours	14 days	Weak on fruit scab and should be tank-mixed with a compatible protectant fungicide if used after Bloom . See options for apple scab control at Half-inch green to tight cluster .
		Nova	340 g/ha	12 hours ^{1,3} / 5 days ⁴ / 12 days ²	14 days	
	3+7	Aprovia Top 195 EC	643 mL/ha	12 hours	30 days	Weak on fruit scab and should be tank-mixed with a compatible protectant fungicide if used after Bloom . See options for apple scab control at Half-inch green to tight cluster .

¹ General re-entry. ² Hand thinning. ³ Contact and scouting activities. ⁴ Hand harvest. ⁵ Pick-your-own harvest. ⁶ Apply no later than 14 days after petal fall. ⁷ General re-entry in traditional low- to medium-density orchards. ⁸ General re-entry in high-density, trellised orchards. ⁹ Hand thinning and managing hand-line irrigation in traditional low- to medium-density orchards.

¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Tight cluster to pink						
Rust (cont'd)	3+9	Inspire Super	836 mL/ha	12 hours	14 days	Weak on fruit scab and should be tank-mixed with a compatible protectant fungicide if used after Bloom . See options for apple scab control at Half-inch green to tight cluster .
	7	Fontelis	1.0–1.5 L/ha	12 hours	28 days	Contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions. Weak on fruit scab and should be tank-mixed with a compatible protectant fungicide if used after Bloom . See options for apple scab control at Half-inch green to tight cluster .
	11	Flint	140 g/ha	12 hours ¹ / 4 days ²	14 days	Weak on fruit scab and should be tank-mixed with a compatible protectant fungicide if used after Bloom . See options for apple scab control at Half-inch green to tight cluster . Do not tank-mix or make sequential applications with Exirel.
	29	Allegro 500 F	0.75–1.0 L/ha	24 hours ¹ / 72 hours ²	28 days	In orchards with high disease pressure or susceptible cultivars, use high rate. Do not mix with oil. May provide mite suppression. For suppression only of Quince rust, use 1.0 L/ha.
Pink						
Scab	Use one of the products listed for Scab at Half-inch green to tight cluster . Pink through to petal fall is a high risk period for scab infection. See ontario.ca/cropIPM for information on infection periods. Keep new growth covered.					
Powdery mildew	General Comments: - Apply fungicides beginning at Green tip and continue to First summer spray. Additional sprays beyond First summer spray may be needed on susceptible cultivars or if disease pressure is severe. - For resistance management, use a maximum of 2 applications of products per fungicide group from Group 3, 7 and 11 per season.					
	M	Cosavet DF Edge * or Kumulus DF * or Microscopic Sulphur WP * or Microthiol Disperss *	22.5 kg/ha 22.5 kg/ha 6.5 kg/1,000 L water 22.5 kg/ha	24 hours	1 day	May cause an increase in red mite and scale populations. Do not use within 14 days of Purespray Green Spray Oil and 30 days of Vegol Crop Oil or Superior Oil.
	1	Senator 50 SC	250 mL/1,000 L water	12 hours	1 day	No product specific comments.
	3	Fullback 125 SC	585–877 mL/ha	12 hours	14 days	No product specific comments.
		Nova	340 g/ha	12 hours ^{1,3} / 5 days ⁴ / 12 days ²	14 days	No product specific comments.

¹ General re-entry. ² Hand thinning. ³ Contact and scouting activities. ⁴ Hand harvest. ⁵ Pick-your-own harvest. ⁶ Apply no later than 14 days after petal fall. ⁷ General re-entry in traditional low- to medium-density orchards. ⁸ General re-entry in high-density, trellised orchards. ⁹ Hand thinning and managing hand-line irrigation in traditional low- to medium-density orchards.

¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Pink						
Powdery mildew (cont'd)	3+7	Aprovia Top 195 EC	643 mL/ha	12 hours	30 days	No product specific comments.
	3+9	Inspire Super	836 mL/ha	12 hours	14 days	Suppression only.
	7	Fontelis	1.0–1.5 L/ha	12 hours	28 days	Contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
		Sercadis	167–333 mL/ha	12 hours	0 days	Use with a non-ionic surfactant at a rate of 0.125% v/v (1.25 L in 1,000 L water). See Table 2–8. <i>Adjuvants Used in Ontario</i> , page 85.
	7+9	Luna Tranquility	600 mL/ha	12 hours ¹ / 24 hours ²	14 days	No product specific comments.
	7+11	Pristine WG	1.0–1.2 kg/ha	when dry ¹ / 5 days ⁴ / 12 days ²	5 days	Do not tank-mix or make sequential applications with Exirel.
	11	Flint	140–210 g/ha	12 hours ¹ / 4 days ²	14 days	Do not tank-mix or make sequential applications with Exirel.
		Sovran	240 g/ha	48 hours	30 days	
	44	Serenade OPTI *	1.7–3.3 kg/ha	when dry	0 days	Suppression only. Apply preventatively at 7–10-day intervals. Use in conjunction with other cultural or chemical controls.
	NC	Buran *	9 L/ha	when dry	0 days	Suppression only. See comments for this product for Powdery mildew at Green tip to half-inch green .
		Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	Suppression only. See comments for this product for Powdery mildew at Green tip to half-inch green .
		Vegol Crop Oil *	2% v/v	12 hours	0 days	Suppression only. See comments for this product for Powdery mildew at Green tip to half-inch green .
	P5	Regalia Maxx *	0.125% v/v in 1,000 L water/ha	when dry	0 days	Suppression only. Reapply every 7–10 days if conditions are conducive to disease development.
Phytophthora crown and root rot	Use one of the products listed for Phytophthora crown and root rot at Tight cluster to pink .					

¹ General re-entry. ² Hand thinning. ³ Contact and scouting activities. ⁴ Hand harvest. ⁵ Pick-your-own harvest. ⁶ Apply no later than 14 days after petal fall. ⁷ General re-entry in traditional low- to medium-density orchards. ⁸ General re-entry in high-density, trellised orchards. ⁹ Hand thinning and managing hand-line irrigation in traditional low- to medium-density orchards.

¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Pink						
Black rot	General Comments: Apply fungicides preventatively to susceptible cultivars in orchards with a history of black rot infections, particularly during wet weather.					
	M	Folpan 80 WDG	3.0–3.75 kg/ha	24 hours	—	May cause russetting to Delicious or other sensitive cultivars when used pink to 30 days after petal fall. Do not use within 14 days of oil.
		Granuflo-T	1.5–2.25 kg/ 1,000 L water	24 hours	28 days	No product specific comments.
		Maestro 80 DF or Supra Captan 80 WDG	3.75 kg/ha	48 hours	7 days	Do not use within 14 days of oil or as a tank-mix or sequential application with products containing oil such as Fontelis or Exirel.
	7+11	Pristine WG	1.0–1.2 kg/ha	when dry ¹ / 5 days ⁴ / 12 days ²	5 days	Do not tank-mix or make sequential applications with Exirel.
	29	Allegro 500 F	1.0 L/ha	24 hours ¹ / 72 hours ²	28 days	Suppression only. Do not mix with oil. May provide mite suppression.
Rosy apple aphid	General Comments: - Spray if 20 or more clusters in a 100-cluster sample are infested. - Some products are toxic to bees. Do not apply during bloom or when bees are active in the orchard. Refer to label for specific bee toxicity statements.					
	4A	Assail 70 WP	120 g/ha	12 hours ¹ / 48 hours ³ / 6 days ²	7 days	Maximum of 2 applications of products from this group per season. Repeated use may result in mite outbreaks.
		Calypso 480 SC	145–290 mL/ha	12 hours	30 days	
	4C	Closer	100–200 mL/ha	12 hours	7 days	Where possible, rotate with products outside of Group 4.
	4C+5	TwinGuard	250 g/ha	12 hours	7 days	Where possible, rotate with products outside of Group 4.
	4D	Sivanto Prime	500–750 mL/ha	12 hours	14 days	Where possible, rotate with products outside of Group 4.
	28	Exirel	1.5 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
	29	Beleaf 50 SG	160 g/ha	12 hours ¹ / 48 hours ²	21 days	No product specific comments.
	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	Suppression only. See comments for this product for Rosy apple aphid at Half-inch green to tight cluster.
		Vegol Crop Oil *	2% v/v	12 hours	0 days	See comments for this product for Rosy apply aphid at Half-inch green to tight cluster.

¹ General re-entry. ² Hand thinning. ³ Contact and scouting activities. ⁴ Hand harvest. ⁵ Pick-your-own harvest. ⁶ Apply no later than 14 days after petal fall. ⁷ General re-entry in traditional low- to medium-density orchards. ⁸ General re-entry in high-density, trellised orchards. ⁹ Hand thinning and managing hand-line irrigation in traditional low- to medium-density orchards.

¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Pink						
European apple sawfly	General Comments: • Apply where there has been a history of damage. • Use 3-D white sticky traps to monitor for sawfly adults. Reapply at petal fall if monitoring indicates populations have reached economic thresholds. • Some products are toxic to bees. Do not apply during Bloom or when bees are active in the orchard. Refer to label for specific bee toxicity statements.					
	4A	Assail 70 WP	240 g/ha	12 hours ¹ / 48 hours ³ / 6 days ²	7 days	Maximum of 2 applications from this group per season. Repeated use may result in mite outbreaks.
		Calypso 480 SC	290 mL/ha	12 hours	30 days	
	5	Delegate	420 g/ha	12 hours	7 days	Reapply at 14–21-day intervals if monitoring indicates a need.
	28	Exirel	1 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
Bloom						
DO NOT APPLY INSECTICIDES WHILE APPLE TREES ARE IN BLOOM. SEE BEE POISONING, PAGE 5.						
Scab	General Comments: • Pink through to petal fall is a high risk period for scab infection. See ontario.ca/cropIPM for information on infection periods. Keep new growth covered. • For resistance management, use a maximum of 2 applications of products per fungicide group from Group 3, 7 and 11 per season.					
	M	Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	May cause russetting of light coloured cultivars. If concerned about sensitivity of fruit, test first on a small area.
		Dithane Rainshield or Manzate Pro-stick or Penncozeb 75 Raincoat	2 kg/1,000 L water 6 kg/ha 2 kg/1,000 L water	12 hours	24 hours	No product specific comments.
		Folpan 80 WDG	3.0–3.75 kg /ha	24 hours	—	May cause russetting to Delicious or other sensitive cultivars when used pink to 30 days after petal fall. Do not use within 14 days of oil.
		Granuflo-T	1.5–2.25 kg/1,000 L water	24 hours	28 days	No product specific comments.
		Maestro 80 DF or Supra Captan 80 WDG	3.75 kg/ha	48 hours	7 days	Do not use within 14 days of oil or as a tank-mix or sequential application with products containing oil such as Fontelis or Exirel.
		Polyram DF	6 kg/ha	12 hours	45 days	No product specific comments.
	3	Fullback 125 SC plus 1/2 to full rate Group M	950 mL/ha See Group M above	12 hours	14 days	Resistance to some Group 3 fungicides has been confirmed in Ontario. Check the status of these products before using them in your orchard. See <i>Managing Resistance to Fungicides</i> , page 394. Residues last 5–8 days. In conditions of rapid growth or high disease pressure, shorten intervals between applications. Do not use if apple scab is present. These products do not provide good control of fruit scab, so do not use for scab after Bloom .
		Nova plus 1/2 to full rate Group M	340 g/ha See Group M above	12 hours ^{1,3} / 5 days ⁴ / 12 days ²	14 days	

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¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Bloom						
DO NOT APPLY INSECTICIDES WHILE APPLE TREES ARE IN BLOOM. SEE BEE POISONING, PAGE 5.						
Scab (cont'd)	3+7	Aprovia Top 195 EC	386–643 mL/ha	12 hours	30 days	In conditions of rapid growth or high disease pressure, use high rate and shorten intervals between applications. For resistance management, tank-mix with a compatible protectant apple scab fungicide from a different group. See labels for suggested tank-mix partners. Do not use if apple scab is present.
	3+9	Inspire Super plus 1/2 to full rate Group M	560–836 mL/ha See Group M above	12 hours	14 days	Residues last 5–8 days. In conditions of rapid growth or high disease pressure, use high rate and shorten intervals between applications. Do not use if apple scab is present. These products do not provide good control of fruit scab, so do not use for scab after Bloom .
	7	Fontelis	1.0–1.5 L/ha	12 hours	28 days	In conditions of rapid growth or high disease pressure, use high rate and shorten intervals between applications. For resistance management, tank-mix with a compatible protectant apple scab fungicide from a different group. See labels for suggested tank-mix products. Do not use if apple scab is present. Fontelis contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
		Kenja 400 SC	913 mL/ha	12 hours	20 days	Use Sercadis with a non-ionic surfactant at a rate of 0.125% v/v (1.25 L in 1,000 L water). See Table 2–8. <i>Adjuvants Used in Ontario</i> , page 85.
		Sercadis	333 mL/ha	12 hours	0 days	
	7+11	Pristine WG plus 1/2 to full rate Group M	1.0–1.2 kg/ha See Group M above	when dry ¹ / 5 days ⁴ / 12 days ²	5 days	Residues last 5–8 days. In conditions of rapid growth or high disease pressure, use high rate and shorten intervals between applications. Do not use if apple scab is present. Do not tank-mix or make sequential applications with Exirel.
	11	Flint plus 1/2 to full rate Group M	140 g/ha See Group M above	12 hours ¹ / 4 days ²	14 days	Resistance to some Group 11 fungicides has been confirmed in Ontario. Check the status of these products before using them in your orchard. See <i>Managing Resistance to Fungicides</i> , page 394. Residues last 5–8 days.
		Sovran plus 1/2 to full rate Group M	240 g/ha See Group M above	48 hours	30 days	In conditions of rapid growth or high disease pressure, shorten intervals between applications. Do not use if apple scab is present. Do not tank-mix or make sequential applications with Exirel.
	29	Allegro 500 F	0.5–1.0 L/ha	24 hours ¹ / 72 hours ²	28 days	In orchards with high disease pressure or susceptible cultivars, use high rate. Do not mix with oil. May provide mite suppression.
	44	Serenade OPTI *	1.7–3.3 kg/ha	when dry	0 days	Suppression only. Apply preventatively at 7–10-day intervals. Use in conjunction with other cultural or chemical controls.
	NC	Buran *	1.8% v/v (ie., 9L in 500 L water/ha)	when dry	0 days	Suppression only. See comments for this product for Scab at Half-inch green to tight cluster .

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¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Bloom						
DO NOT APPLY INSECTICIDES WHILE APPLE TREES ARE IN BLOOM. SEE BEE POISONING, PAGE 5.						
Fire blight	General Comments: - Models to time fire blight sprays (e.g., Maryblyt, Cougar Blight) are available. See ontario.ca/cropIPM for more information. Ontario prediction maps are also available at omafra.gov.on.ca/english/crops/facts/fireblight-2apples.htm. - Otherwise, apply sprays if temperatures over 18°C are accompanied by high humidity (over 69%), heavy dews or rainfall. - Spray susceptible cultivars beginning at first bloom until petal fall including rat-tail bloom. - Products are most effective when applied prior to an infection period. Use alone for best results. - For resistance management, rotate between chemical groups.					
	M	Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	May cause russetting of light coloured cultivars. If concerned about sensitivity of fruit, test first on a small area. Reapply every 3–7 days if conditions favour disease development.
	24	Kasumin 2L	5.0 L in 1,000 L water/ha	12 hours	90 days	Apply at 20–30% bloom, or when conditions favour disease development. Rotate to another chemical group after 2–3 days if warm, wet conditions (above 18°C) are forecast. If using lower water volumes, refer to the water volume chart on label for rate recommendations.
	25	Streptomycin 17	600 g/1,000 L water	24 hours ¹ / 7 days ³ / 14 days ²	50 days	Apply at 20–30% bloom, or when conditions favour disease development. Rotate to another chemical group after 2–3 days if warm, wet conditions (above 18°C) are forecast. Degrades rapidly in UV. May provide some kick-back activity if applied within 24 hours following an infection event.
	44	Double Nickel LC *	5.0–7.5 L/ha	when dry	0 days	Suppression only. Apply at 1–5% bloom and reapply every 3–7 days if conditions favour disease development. Can be mixed with copper fungicides to improve control.
		Serenade OPTI *	1.1–1.7 kg/ha	when dry	0 days	Suppression only. Apply at 1–5% bloom and repeat as needed if conditions favour disease development. Under high pressure, follow with Streptomycin 2–3 days later.
	NC	Blossom Protect *	See comments	when dry	0 days	For every 1 m of tree height, dilute 5.25 kg Component A in 500 L/ha water and add dilution to 0.75 kg Component B. If a forecast system is available, apply 1–2 days before an infection date. Repeat after 2 days and up to 5 times if infection continues. If no forecast system is available, apply at 10, 40, 70 and 90% open blossoms. This product is sensitive to fungicides and may have reduced efficacy if tank-mixed or applied within 2 days of certain products. See label for further details. Russetting may occur on sensitive cultivars. Do not apply more than 2 times on Golden Delicious, Idared and Jonagold or to control rat-tail blossom.

¹ General re-entry. ² Hand thinning. ³ Contact and scouting activities. ⁴ Hand harvest. ⁵ Pick-your-own harvest. ⁶ Apply no later than 14 days after petal fall. ⁷ General re-entry in traditional low- to medium-density orchards. ⁸ General re-entry in high-density, trellised orchards. ⁹ Hand thinning and managing hand-line irrigation in traditional low- to medium-density orchards.

¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Bloom						
DO NOT APPLY INSECTICIDES WHILE APPLE TREES ARE IN BLOOM. SEE BEE POISONING, PAGE 5.						
Russetting	NC	Promalin SL	250–500 mL/ha	12 hours	28 days	Apply at 7–12-day intervals, beginning at full bloom to petal fall. In long cold, wet or humid periods during bloom, use high rate and shorten intervals between applications. Apply during periods of slow drying conditions to maximize efficacy. Do not use when temperatures are below freezing, above 30°C or if rain is forecast within 6 hours. Promalin cannot reduce russetting caused by frost damage, disease, herbicide drift or phytotoxicity. Visit ontario.ca/apples and click on <i>Plant Growth Regulators for Fruit Crops</i> .
Fruit shape	General Comments: • Apply during slow drying conditions. • Spray first application or only application between full king bloom and early petal fall. • Do not use when temperatures are below freezing, above 30°C or if rain is forecast within 6 hours. • These products may increase the amount of thinning achieved with subsequent blossom thinning sprays. • Visit ontario.ca/apples and click on <i>Thinning in Tree Fruit</i> for more information.					
	NC	Perlan	1.2–2.3 L/ha	12 hours	28 days	For use on Red Delicious only. Apply between 40–80% king bloom and early petal fall. If a prolonged bloom occurs, apply 1.2 L/ha and reapply 5–7 days later.
		Promalin SL	0.6–2.3 L/ha	12 hours	28 days	Use on fruit that has a natural typiness like Red Delicious, Golden Delicious, Ambrosia and Gala to elongate fruit and develop more prominent calyx lobes. Apply a single application of 1.2–2.3 L/ha between early king bloom and early petal fall of side blooms. Alternatively, if a prolonged bloom occurs, apply two applications of 0.6–1.2 L/ha between early king bloom to early petal fall of side blooms and 3–21 days later (or when the rest of the canopy is in bloom).
Late bloom/early petal fall						
Fire blight (suppression of shoot blight stage)	NC	Apogee	450 g/1,000 L water	12 hours	45 days	Reduces vegetative growth, making trees less susceptible to fire blight shoot infection. Has no impact on blossom blight or fire blight bacteria. Apply in late bloom or king bloom petal fall when terminal and/or bourse shoots are 2.5–5.5 cm long. Accurate timing is critical. Will help suppress fire blight infections from this point on. Reapply 14–21 days later. In plantings with low vigour, a reduction in shoot growth caused by the high rate for fire blight suppression may be undesirable.

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¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Late bloom/early petal fall						
Vegetative growth control	NC	Apogee	270–450 g/ 1,000 L water	12 hours	45 days	Apply in late bloom or early petal fall when terminal and/or bourse shoots are 2.5–5 cm long. Accurate timing is critical. Use high rate for medium to high vigour trees. See Table 2–11. <i>Suggested Apogee Rates (g Apogee per ha)</i> , page 89. Reapply at 14–21-day intervals if needed. Uptake can be enhanced with the addition of 0.05% v/v non-ionic surfactant. See Table 2–8. <i>Adjuvants Used in Ontario</i> , page 85. Do not tank-mix with calcium. Severe cracking can occur on Empire and Stayman cultivars and decrease in yield in Cortland. Visit ontario.ca/apples and click on <i>Plant Growth Regulators for Fruit Crops</i> .
Fruit shape	Use one of the products listed for Fruit shape at Bloom .					
Petal fall (Calyx) when most petals have fallen Some products control more than one pest. See Table 2–5. <i>Activity of Petal Fall Insecticides Against Orchard Pests</i> , page 82.						
Scab	Use one of the products listed for Scab at Bloom . Cueva may cause russetting of light coloured cultivars. Use 0.8% solution if fruit is present. Do not use Sercadis after Petal fall (Calyx) .					
Powdery mildew	Use one of the products listed for Powdery mildew at Pink . Do not use Sercadis after Petal fall (Calyx) . Use caution with sulphur and oil during hot weather.					
Black rot	Use one of the products listed for Black rot at Pink .					
Bitter rot	General Comments: • Apply fungicides preventatively to susceptible cultivars, such as Empire, Ambrosia, Honeycrisp and Golden Delicious, in orchards with a history of infections. • Warm, wet weather during fruit maturity favours disease development.					
	M	Granuflo-T	1.5–2.25 kg/ 1,000 L water	24 hours	28 days	No product specific comments.
	7+11	Pristine WG	1.0–1.2 kg/ha	when dry ¹ / 5 days ⁴ / 12 days ²	5 days	In orchards with high disease pressure, use high rate and shorten intervals between applications. Do not tank-mix or make sequential applications with Exirel.
	29	Allegro 500 F	0.75–1.0 L/ha	24 hours ¹ / 72 hours ²	28 days	In orchards with high disease pressure, use high rate and shorten intervals between applications. Do not mix with oil. May provide mite suppression.
	P5	Regalia Maxx *	0.125% v/v in 1,000 L water/ha	when dry	0 days	Suppression only. Reapply every 7–10 days if conditions are conducive to disease development.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Petal fall (Calyx) when most petals have fallen						
Some products control more than one pest. See Table 2–5. <i>Activity of Petal Fall Insecticides Against Orchard Pests</i> , page 82.						
Alternaria blotch	General Comments: - This disease is not typically an economically damaging issue in Ontario. - Apply fungicides preventatively to susceptible cultivars such as Delicious strains in orchards with a history of Alternaria blotch.					
	M	Folpan 80 WDG	3.0–3.75 kg/ha	24 hours	—	May cause russetting to Delicious or other sensitive cultivars when used Pink to 30 days after petal fall. Do not apply within 14 days of oil.
	3+7	Aprovia Top 195 EC	643 mL/ha	12 hours	30 days	No product specific comments.
	29	Allegro 500 F	0.75–1.0 L/ha	24 hours ¹ / 72 hours ²	28 days	In orchards with high disease pressure or susceptible cultivars, use high rate. Do not mix with oil. May provide mite suppression.
Blister spot	33	Aliette	2 kg/ha	when dry	30 days	Apply preventatively to susceptible cultivars such as Mutsu/Crispin, Jonagold and Golden Delicious. Begin applications at Petal fall (calyx) with 1–2 subsequent sprays at 7-day intervals. Do not mix with copper.
Dogwood borer	NC	Isomate DWB	250–375 dispensers/ha	—	—	Apply before adult borer emergence (end of May). Use high rate for high-pressure areas or initial year of treatment. For information on mating disruption, see OMAFRA Factsheet 03–079, <i>Mating Disruption for Management of Insect Pests</i> .
Tentiform leafminer	General Comments: Some of these products are toxic to bees. Do not apply when bees are active in the orchard. Refer to label for specific bee toxicity statements.					
	3	Ambush 500 EC or Perm-Up EC or Pounce 384 EC	400 mL/ha 520 mL/ha 520 mL/ha	when dry	7 days	If egg hatch is delayed, apply at Petal fall (calyx) when first sap-feeding miner is detected. These products are highly toxic to beneficial insects and may lead to mite outbreaks. Maximum of 1 application of product from this group per season.
		Decis 5 EC	250 mL/ha	12 hours	1 day	
		Mako or Up-Cyde 2.5 EC	250 mL/ha 400 mL/ha	12 hours	7 days	
		Matador 120 EC or Silencer 120 EC	83 mL/ha	24 hours	7 days	
	4A	Actara 25 WG	315 g/ha	12 hours	60 days	Apply when population is mainly in the sap-feeder stage. Maximum of 2 applications of product from this group per season. Repeated use may result in mite outbreaks.
		Admire 240 Flowable or Alias 240 SC	380 mL/ha	24 hours	7 days	

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¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Petal fall (Calyx) when most petals have fallen						
Some products control more than one pest. See Table 2–5. Activity of Petal Fall Insecticides Against Orchard Pests, page 82.						
Tentiform leafminer (cont'd)	4A	Assail 70 WP	80 g/ha	12 hours ¹ / 48 hours ³ / 6 days ²	7 days	Apply when population is mainly in the sap-feeder stage. Maximum of 2 applications of product from this group per season. Repeated use may result in mite outbreaks.
		Calypso 480 SC	145 mL/ha	12 hours	30 days	
		Clutch 50 WDG	140–210 g/ha	12 hours	7 days	
	4C+5	TwinGuard	250–500 g/ha	12 hours	7 days	Apply at egg hatch or at first sign of sap-feeder stage. Where possible, rotate with products outside of Group 4 between generations.
	5	Delegate	420 g/ha	12 hours	7 days	Apply when population is mainly in the sap-feeder stage.
	6	Agri-Mek SC	170 mL/ha	12 hours	28 days	Apply at egg hatch or at first sign of sap-feeder stage. Do not apply later than 21 days after petal fall. Apply with 10 L of oil and a minimum of 1,000 L water/ha. Agri-Mek plus oil may cause russetting on Golden Delicious and other light-skinned cultivars. Do not use within 14 days of Supra Captan, Maestro, Folpan or other products containing sulphur.
	28	Altacor	215 g/ha	12 hours	5 days	Apply when population is mainly in the sap-feeder stage. Do not tank-mix or make sequential applications of Exirel with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
		Exirel	500–750 mL/ha	12 hours	3 days	
Rosy apple aphid	General Comments: • Spray if 20 or more clusters in a 100-cluster sample are infested. • Some of these products are toxic to bees. Do not apply when bees are active in the orchard. Refer to label for specific bee toxicity statements.					
	4A	Actara 25 WG	160 g/ha	12 hours	60 days	Maximum of 2 applications of product from this group per season. Repeated use may result in mite outbreaks.
		Admire 240 Flowable or Alias 240 SC	230 mL/ha	24 hours	7 days	
		Assail 70 WP	120 g/ha	12 hours ¹ / 48 hours ³ / 6 days ²	7 days	
		Calypso 480 SC	145–290 mL/ha	12 hours	30 days	
		Clutch 50 WDG	140–210 g/ha	12 hours	7 days	
	4C	Closer	100–200 mL/ha	12 hours	7 days	Where possible, rotate with products outside of Group 4.

¹ General re-entry. ² Hand thinning. ³ Contact and scouting activities. ⁴ Hand harvest. ⁵ Pick-your-own harvest. ⁶ Apply no later than 14 days after petal fall. ⁷ General re-entry in traditional low- to medium-density orchards. ⁸ General re-entry in high-density, trellised orchards. ⁹ Hand thinning and managing hand-line irrigation in traditional low- to medium-density orchards.

¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Petal fall (Calyx) when most petals have fallen						
Some products control more than one pest. See Table 2–5. <i>Activity of Petal Fall Insecticides Against Orchard Pests</i> , page 82.						
Rosy apple aphid (cont'd)	4C+5	TwinGuard	250 g/ha	12 hours	7 days	Where possible, rotate with products outside of Group 4.
	4D	Sivanto Prime	500–750 mL/ha	12 hours	14 days	Where possible, rotate with products outside of Group 4.
	23	Movento 240 SC	365 mL/ha	12 hours	7 days	Control may not be apparent for 2–3 weeks. Under high pest pressure, reapply 2 weeks later. Tank-mix with an adjuvant/additive that has spreading and penetrating properties at a suggested rate of 0.2% v/v. See label and Table 2–8. <i>Adjuvants Used in Ontario</i> , page 85 for further details. Do not tank-mix with sulphur.
	28	Exirel	1.5 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
	29	Beleaf 50 SG	160 g/ha	12 hours ¹ / 48 hours ²	21 days	No product specific comments.
	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	Suppression only. See comments for this product for Rosy apple aphid at Half-inch green to tight cluster.
		Vegol Crop Oil *	2% v/v	12 hours	0 days	See comments for this product for Rosy apple aphid at Half-inch green to tight cluster.
Mullein bug	General Comments: • Monitor susceptible cultivars such as Red Delicious, Spartan, Northern Spy, Empire, Cortland, Gala, Jonagold and Golden Delicious. • Apply controls where 7–9 nymphs are caught per 25 tree taps. • Damage is not a concern once fruit is larger than dime- to quarter-sized. • Some of these products are toxic to bees. Do not apply when bees are active in the orchard. Refer to label for specific bee toxicity statements.					
	4A	Actara 25 WG	315 g/ha	12 hours	60 days	Maximum of 2 applications of product from this group per season. Repeated use may result in mite outbreaks.
		Admire 240 Flowable or Alias 240 SC	380 mL/ha	24 hours	7 days	
		Assail 70 WP	80–160 g/ha	12 hours ¹ / 48 hours ³ / 6 days ²	7 days	
		Calypso 480 SC	290 mL/ha	12 hours	30 days	

¹ General re-entry. ² Hand thinning. ³ Contact and scouting activities. ⁴ Hand harvest. ⁵ Pick-your-own harvest. ⁶ Apply no later than 14 days after petal fall. ⁷ General re-entry in traditional low- to medium-density orchards. ⁸ General re-entry in high-density, trellised orchards. ⁹ Hand thinning and managing hand-line irrigation in traditional low- to medium-density orchards.

¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Petal fall (Calyx) when most petals have fallen						
Some products control more than one pest. See Table 2–5. <i>Activity of Petal Fall Insecticides Against Orchard Pests</i> , page 82.						
San Jose scale	General Comments: • Apply when the crawlers are active in orchards with a history of scale. In Ontario, first generation crawler activity typically begins mid- to late June. • Pheromone traps for adult flight and degree-day models can be used to determine optimal spray timing. For more information, see Appendix B: <i>Degree-Day Modeling</i>, page 428. • Thorough coverage of trunk and limbs is essential for good control. • These products are toxic to bees. Do not apply when bees are active in the orchard. Refer to label for specific bee toxicity statements.					
	4C	Closer	400 mL/ha	12 hours	7 days	Reapply, if necessary, after 14 days. Where possible, rotate with products outside of Group 4.
	4C+5	TwinGuard	500 g/ha	12 hours	7 days	Reapply, if necessary, after 14 days. Where possible, rotate with products outside of Group 4 between generations.
	4D	Sivanto Prime	0.75–1.0 L/ha plus 0.25% v/v oil	12 hours	14 days	If using oil, may cause bark injury on some cultivars, such as Red Delicious, Empire and Mutsu/Crispin. Do not use oil within 14 days of Supra Captan, Maestro, Folpan or sulphur. Do not apply when temperatures exceed 30°C, to crops under moisture stress or just prior to rain. Reapply, if necessary, after 14 days. Where possible, rotate with products outside of Group 4.
	23	Movento 240 SC	365 mL/ha	12 hours	7 days	Control may not be apparent for 2–3 weeks. Apply 1–2 weeks before expected crawler emergence. Under high pest pressure, reapply 2 weeks later. Tank-mix with an adjuvant/additive that has spreading and penetrating properties at a suggested rate of 0.2% v/v. See label and Table 2–8. <i>Adjuvants Used in Ontario</i> , page 85 for further details. Do not tank-mix with sulphur.
Plum curculio	General Comments: • Some of these products are toxic to bees. Do not apply when bees are active in the orchard. Refer to label for specific bee toxicity statements.					
	1B	Imidan WP	2.68 kg/ha	7 days ^{1†} / 14 days ⁵ / 30 days ²	14 days	Apply at petal fall, or when monitoring indicates plum curculio is in the orchard.
	4A	Actara 25 WG	385 g/ha	12 hours	60 days	Apply at petal fall or when monitoring indicates plum curculio is in the orchard. Do not use as a border spray. Maximum of 2 applications of product from this group per season. Repeated use may result in mite outbreaks.
		Assail 70 WP	120–240 g/ha	12 hours ¹ / 48 hours ³ / 6 days ²	7 days	
		Calypso 480 SC	440 mL/ha	12 hours	30 days	
		Clutch 50 WDG	210 g/ha	12 hours	7 days	

¹ General re-entry. ² Hand thinning. ³ Contact and scouting activities. ⁴ Hand harvest. ⁵ Pick-your-own harvest. ⁶ Apply no later than 14 days after petal fall. ⁷ General re-entry in traditional low- to medium-density orchards. ⁸ General re-entry in high-density, trellised orchards. ⁹ Hand thinning and managing hand-line irrigation in traditional low- to medium-density orchards.

¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Petal fall (Calyx) when most petals have fallen						
Some products control more than one pest. See Table 2–5. <i>Activity of Petal Fall Insecticides Against Orchard Pests</i> , page 82.						
Plum curculio (cont'd)	4C+5	TwinGuard	500 g/ha	12 hours	7 days	Suppression only. Apply at first sign of feeding damage after Bloom . Reapply, if necessary, after 14 days.
	28	Exirel	1.0–1.5 L/ha	12 hours	3 days	Apply at first sign of feeding damage after Bloom . Reapply, if necessary, after 10–14 days. Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
	NC	Surround WP *	50 kg/ha	12 hours	0 days	Must be applied before plum curculio is present. Make 2 initial applications at 50 kg/ha, 7 days apart, to establish a base layer. Continue at 7–14-day intervals, using a reduced rate of 25 kg/ha, to maintain even coverage of developing fruits. Do not use as a border spray. Light to moderate rain will help distribute product. Reapply after heavy rain, strong wind or overhead irrigation. White film will remain on fruit if applied near harvest unless crop will be washed and waxed. May delay sugar accumulation. Do not use with anti-foaming agents, spreader/stickers or summer oils.
European apple sawfly	General Comments: • Apply where there has been a history of damage. • Use 3-D white sticky traps to monitor for sawfly adults. If a prebloom insecticide has been applied, spray postbloom when 6 sawflies have been caught per trap. Where no prebloom insecticides have been applied, spray postbloom when 3 sawflies have been caught per trap. • Some of these products are toxic to bees. Do not apply when bees are active in the orchard. Refer to label for specific bee toxicity statements.					
	4A	Assail 70 WP	240 g/ha	12 hours ¹ / 48 hours ³ / 6 days ²	7 days	Maximum of 2 applications from this group per season. Repeated use may result in mite outbreaks.
		Calypso 480 SC	290 mL/ha	12 hours	30 days	
	5	Delegate	420 g/ha	12 hours	7 days	Reapply at 14–21 days if monitoring indicates a need.
	28	Altacor	215 g/ha	12 hours	5 days	No product specific comments.
		Exirel	1 L/ha	12 hours	3 days	

¹ General re-entry. ² Hand thinning. ³ Contact and scouting activities. ⁴ Hand harvest. ⁵ Pick-your-own harvest. ⁶ Apply no later than 14 days after petal fall. ⁷ General re-entry in traditional low- to medium-density orchards. ⁸ General re-entry in high-density, trellised orchards. ⁹ Hand thinning and managing hand-line irrigation in traditional low- to medium-density orchards.

¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Petal fall (Calyx) when most petals have fallen Some products control more than one pest. See Table 2–5. <i>Activity of Petal Fall Insecticides Against Orchard Pests</i> , page 82.						
European red mite	General Comments: • Presence of beneficial insects should be considered before applying a spray. For more information on beneficial insects, see ontario.ca/cropipm. • Thorough spray coverage is essential for good control. • Miticides are best applied alone. • For resistance management, do not use more than once per season. See Table 2–6. <i>Activity of Miticides Registered on Apple and/or Pear in Ontario</i>, page 83.					
	6	Agri-Mek SC	170 mL/ha	12 hours	28 days	Apply before a threshold of 5 mites per leaf is reached, no later than 21 days after petal fall. Apply with 10 L of oil and a minimum of 1,000 L water/ha. May cause russetting on Golden Delicious and other light-skinned cultivars. Do not use within 14 days of Supra Captan, Maestro, Folpan or other products containing sulphur.
	10	Apollo SC	300 mL/ha	12 hours ¹ / 48 hours ²	21 days ⁶	Apply when mites are mostly in the egg stage and before there are more than 3 active mites per leaf.
	20	Kanemite 15 SC	2.1 L/ha	12 hours ¹ / 5 days ²	14 days	Apply when there are 5–7 active mites per leaf.
	21	Nexter	300 g/ha	24 hours	25 days	Apply when there are 5–7 active mites per leaf. Also controls apple rust mites.
	23	Envirdor 240 SC	750 mL/ha	12 hours	7 days	Apply when there are 5–7 active mites per leaf. Control may not be apparent for up to 1 week. Also controls apple rust mites.
	25	Nealta	1 L/ha	12 hours	7 days	Apply as mite populations begin to build, before mite damage is observed. The use of an adjuvant registered for use in the crop may improve performance. See Table 2–8. <i>Adjuvants Used in Ontario</i> , page 85.
	29	Allegro 500 F	0.75–1.0 L/ha	24 hours ¹ / 72 hours ²	28 days	When used to control listed diseases, may provide mite suppression.
	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	Suppression only. See comments for this product for European red mite at Half-inch green to tight cluster .
		Vegol Crop Oil *	2% v/v	12 hours	0 days	See comments for this product for European red mite at Half-inch green to tight cluster .
	UN	Acramite 50 WS	851 g/ha or 3.75 pouches/ha	12 hours	7 days	Apply when there are 5–7 active mites per leaf.

¹ General re-entry. ² Hand thinning. ³ Contact and scouting activities. ⁴ Hand harvest. ⁵ Pick-your-own harvest. ⁶ Apply no later than 14 days after petal fall. ⁷ General re-entry in traditional low- to medium-density orchards. ⁸ General re-entry in high-density, trellised orchards. ⁹ Hand thinning and managing hand-line irrigation in traditional low- to medium-density orchards.

¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Petal fall (Calyx) when most petals have fallen						
Some products control more than one pest. See Table 2–5. <i>Activity of Petal Fall Insecticides Against Orchard Pests</i> , page 82.						
Obliquebanded leafroller	General Comments: • Spray overwintering obliquebanded leafroller in orchards with historical pest problems or high pest pressure (1–2% of the terminals or buds have larvae or damage). • Place pheromone traps in orchards at petal fall to monitor emergence of summer-generation obliquebanded leafroller.					
	4C+5	TwinGuard	500 g/ha	12 hours	7 days	Reapply, if necessary, after 14 days.
	5	Delegate	420 g/ha	12 hours	7 days	Reapply, if necessary, after 14 days.
		Entrust * or Success	182 mL/ha 364 mL/ha	when dry	7 days	No product specific comments.
	11	Bioprotec CAF * or Dipel 2X DF * or Foray 48 BA	4 L/ha 1.12 kg/ha 2.8 L/ha	12 hours	0 days	Product must be consumed to be effective. Spray when and where pests are actively feeding. Apply in a high-volume spray to ensure thorough coverage on both sides of the leaf. Apply to young larvae, early in infestation. Death of insect may take several days. Reapply at 5–7-day intervals if larvae activity is extended. Acidify spray mix to below pH 7.0 and apply on cloudy days or in the evening.
	18	Confirm 240 F	1 L/ha	12 hours	14 days	Cross-resistance to this group and pyrethroids may be possible in organophosphate-resistant populations.
		Intrepid	750 mL/ha	12 hours	14 days	
	28	Altacor	285 g/ha	12 hours	5 days	If larvae activity is extended, reapply 10 days later. Do not tank-mix or make sequential applications of Exirel with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
		Exirel	0.5–1.0 L/ha	12 hours	3 days	
Oriental fruit moth	General Comments: • This is a special spray for orchards where there is a history of damage. • Adjust spray timing based on monitoring. Apply insecticides 6–10 days after upswing in pheromone trap catches, which often coincides with petal fall. • Alternatively, accumulate degree-days (base 7.2°C) at first sustained moth catch (biofix) and apply insecticides targeting first-generation larvae. For information on calculating degree days, see Appendix B: <i>Degree-Day Modeling</i>, page 428. • If an insecticide is used at this time to manage oriental fruit moth, mating disruption may be delayed until mid-June. • Some of these products are toxic to bees. Do not apply when bees are active in the orchard. Refer to label for specific bee toxicity statements.					
	3	Decis 5 EC	250 mL/ha	12 hours	1 day	Apply at 194–208 DDC or earlier if using as an ovi-larvicide. Highly toxic to beneficial insects and may lead to mite outbreaks. Maximum of 1 application per season. Apply in 3,000 L water.
	4A	Assail 70 WP	240 g/ha	12 hours ¹ / 48 hours ³ / 6 days ²	7 days	Apply at 139–153 DDC for eggs or larvae. Maximum of 2 applications of product from this group per season. Repeated use may result in mite outbreaks.
		Calypso 480 SC	440 mL/ha	12 hours	30 days	

¹ General re-entry. ² Hand thinning. ³ Contact and scouting activities. ⁴ Hand harvest. ⁵ Pick-your-own harvest. ⁶ Apply no later than 14 days after petal fall. ⁷ General re-entry in traditional low- to medium-density orchards. ⁸ General re-entry in high-density, trellised orchards. ⁹ Hand thinning and managing hand-line irrigation in traditional low- to medium-density orchards.

¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Petal fall (Calyx) when most petals have fallen Some products control more than one pest. See Table 2–5. <i>Activity of Petal Fall Insecticides Against Orchard Pests</i> , page 82.						
Oriental fruit moth (cont'd)	4C+5	TwinGuard	500 g/ha	12 hours	7 days	Apply at 194–208 DDC or earlier if using as an ovi-larvicide. Where possible, rotate with products outside of Group 4 between generations.
	5	Delegate	420 g/ha	12 hours	7 days	Apply at 194–208 DDC or earlier if using as an ovi-larvicide.
	15	Rimon 10 EC	1.4 L/1,000 L water	12 hours	14 days	Apply at 111–139 DDC. Use for first generation only. See comments for this product for codling moth, page 38, below.
	18	Intrepid	1 L/ha	12 hours	14 days	Apply at 139–153 DDC for eggs or larvae.
	28	Altacor	215 g/ha	12 hours	5 days	Apply at 194–208 DDC or earlier if using as an ovi-larvicide.
		Exirel	500–750 mL/ha	12 hours	3 days	Do not tank-mix or make sequential applications of Exirel with strobilurin, copper or captan fungicides. See product label for other tank-mix restrictions.
Codling moth	15	Rimon 10 EC	1.4 L/1,000 L water	12 hours	14 days	Apply at petal fall and reapply 10–14 days later. Use for first generation only. See label for additional information on rates and volumes. Do not allow Rimon to drift onto grapes as leaf spotting may occur. Applied at this time, will provide subsequent control of obliquebanded leafroller and oriental fruit moth. Toxic to bees and bee colonies. Do not apply when bees are active in the orchard.
Leafcurling midge	General Comments: - This is a special spray for orchards where there is a history of damage. - Place pheromone traps in orchard at Pink and begin monitoring for yellow eggs in the newest unfurled leaves. Apply an insecticide shortly after upswing in pheromone trap catches or when eggs have been found, which often coincides with petal fall. - See Table 2–2. <i>Activity of Insecticides and Miticides on Apple Pests</i>, page 70, for efficacy of products.					
	3	Mako or Up-Cyde 2.5 EC	250 mL/ha 400 mL/ha	12 hours	7 days	Maximum of 1 application of product from this group per season. These products are highly toxic to beneficial insects and may lead to mite outbreaks. Do not apply when bees are active in the orchard.
	23	Movento 240 SC	365–585 mL/ha	12 hours	7 days	Suppression only. Control may not be apparent for 2–3 weeks. Under high pest pressure, use high rate and reapply 2 weeks later. Tank-mix with an adjuvant/additive that has spreading and penetrating properties at a suggested rate of 0.2% v/v. See label and Table 2–8. <i>Adjuvants Used in Ontario</i> , page 85 for further details. Do not tank-mix with sulphur.
Russetting	Use one of the products listed for Russetting at Bloom .					
Fruit size	NC	Cilis Plus	0.5–2.5 L/ 1,000 L water	12 hours	28 days	Make 2–4 applications at 3–10-day intervals. May cause thinning in easy to thin cultivars. Use a high-volume spray to ensure thorough coverage. Apply when temperatures are greater than 20°C during and after application. Visit ontario.ca/apples and click on <i>Hand and Chemical Thinning in Tree Fruit</i> .
		MaxCel	0.55–2.65 L/ 1,000 L water	12 hours	86 days	

¹ General re-entry. ² Hand thinning. ³ Contact and scouting activities. ⁴ Hand harvest. ⁵ Pick-your-own harvest. ⁶ Apply no later than 14 days after petal fall. ⁷ General re-entry in traditional low- to medium-density orchards. ⁸ General re-entry in high-density, trellised orchards. ⁹ Hand thinning and managing hand-line irrigation in traditional low- to medium-density orchards.

¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Petal fall (Calyx) when most petals have fallen						
Some products control more than one pest. See Table 2–5. <i>Activity of Petal Fall Insecticides Against Orchard Pests</i> , page 82.						
Fruitlet thinning	General Comments: • Apply during warm, slow drying conditions to maximize absorption. • See Table 2–9. <i>Suggested Rates for Chemical Thinning of Mature Apple Trees</i>, page 87. • Visit ontario.ca/apples and click on <i>Hand and Chemical Thinning in Tree Fruit</i> for more information.					
	NC	Cilis Plus	3.75–10.1 L/ 1,000 L water	12 hours	28 days	See Table 2–10. <i>Suggested Rates of MaxCel or Cilis Plus to Use With or Without Sevin XLR</i> , page 88. Apply when fruitlets are 5–15 mm in diameter. Maximum 2 applications per season for thinning. Apply when temperatures are greater than 20°C during and after application.
		MaxCel	3.95–10.65 L/ 1,000 L water	12 hours	86 days	
		Fruitone -L	39–310 mL/ 1,000 L water	when dry	5 days	Apply between petal fall (3–7 mm fruit size) and early fruit set (8–10 mm fruit size) but most effective when the king fruitlets are 5–10 mm. Applying too soon can cause excessive thinning of Empire. Apply between 21°C and 24°C. Do not apply below 15.6°C or above 26.7°C.
First summer spray – 7–14 days after Petal fall (Calyx)						
Scab	Use one of the products listed for scab at Bloom . An extra scab spray may be required between Petal fall (Calyx) and First summer spray . Cueva may cause russetting of light-skinned cultivars. Use a 0.8% solution if fruit is present. Do not use Sercadis after Petal fall (Calyx) .					
Powdery mildew	Use one of the products listed for Powdery mildew at Pink . Do not use Sercadis after Petal fall (Calyx) . Use caution with sulphur or oil sprays during hot weather.					
Fire blight	General Comments: • Products do not have activity on infected shoots, but rather help prevent spread to other susceptible tissue. • Prune out infected shoots where possible and apply preventative spray immediately after. • Apply within 24 hours of a trauma event such as hail, strong wind or heavy rain to control shoot blight, especially if blossom blight has occurred.					
	M	Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	May cause russetting of light-skinned cultivars. Use a 0.8% solution if fruit is present. If concerned about sensitivity of fruit, test first on a small area. Reapply every 3–7 days if conditions favour disease development.
	25	Streptomycin 17	600 g/1,000 L water	24 hours ¹ / 7 days ³ / 14 days ²	50 days	Keep rat-tail bloom covered if not manually removing secondary blossoms.
	44	Double Nickel LC *	5.0–7.5 L/ha	when dry	0 days	Suppression only. Reapply every 3–7 days if conditions favour disease development. Can be mixed with copper fungicides to improve control.

¹ General re-entry. ² Hand thinning. ³ Contact and scouting activities. ⁴ Hand harvest. ⁵ Pick-your-own harvest. ⁶ Apply no later than 14 days after petal fall. ⁷ General re-entry in traditional low- to medium-density orchards. ⁸ General re-entry in high-density, trellised orchards. ⁹ Hand thinning and managing hand-line irrigation in traditional low- to medium-density orchards. ¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

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¹ General re-entry. ² Hand thinning. ³ Contact and scouting activities. ⁴ Hand harvest. ⁵ Pick-your-own harvest. ⁶ Apply no later than 14 days after petal fall. ⁷ General re-entry in traditional

low- to medium-density orchards. ⁸ General re-entry in high-density, trellised orchards. ⁹ Hand thinning and managing hand-line irrigation in traditional low- to medium-density orchards.

¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
First summer spray – 7–14 days after Petal fall (Calyx)						
Blister spot	General Comments: • Apply preventatively to Mutsu/Crispin, Golden Delicious and other susceptible cultivars.					
	4	Copper 53 W *	3 kg/ha	48 hours	30 days	Apply up to 3 sprays beginning 10 days after petal fall. To reduce the risk of phytotoxicity, use 6 kg of hydrated lime per 1 kg of Copper 53 W per 1,000 L of water. Do not tank-mix lime mixture with other insecticides and fungicides. See label for more information. Apply in 3,000 L water/ha.
	33	Aliette	2 kg/ha	when dry	30 days	Begin applications at petal fall and spray at 7-day intervals. Do not mix with copper.
Plum curculio	Use one of the products listed for Plum curculio at Petal fall (Calyx) .					
European red mite, Two-spotted spider mite	General Comments: • Presence of beneficial insects should be considered before applying spray. For more information on beneficial insects, see ontario.ca/cropipm. • Thorough spray coverage is essential for good control. • Miticides are best applied alone. • For resistance management, do not use more than once per season. See Table 2–6. <i>Activity of Miticides Registered on Apple and/or Pear in Ontario</i>, page 83.					
	6	Agri-Mek SC	170 mL/ha	12 hours	28 days	Apply before a threshold of 5 mites per leaf is reached, no later than 21 days after petal fall. Apply with 10 L of oil and a minimum of 1,000 L water/ha. May cause russetting on Golden Delicious and other light-skinned cultivars. Do not apply within 14 days of Supra Captan, Maestro, Folpan or other products containing sulphur.
	10	Apollo SC	300 mL/ha	12 hours ¹ / 48 hours ²	21 days ⁶	Apply when mites are mostly in the egg stage and before there are more than 3 active mites per leaf.
	20	Kanemite 15 SC	2.1 L/ha	12 hours ¹ / 5 days ²	14 days	Apply when there are 5–7 active mites per leaf.
	21	Nexter	300–600 g/ha	24 hours	25 days	Apply when there are 5–7 active mites per leaf. Use low rate for European red mite and high rate for two-spotted spider mite. Also controls apple rust mites.
	23	Envidor 240 SC	750 mL/ha	12 hours	7 days	Apply when there are 5–7 active mites per leaf. Control may not be apparent for up to 1 week. Also controls apple rust mites.
	25	Nealta	1 L/ha	12 hours	7 days	Apply as mite populations begin to build, before mite damage is observed. The use of an adjuvant registered for use in the crop may improve performance. See Table 2–8. <i>Adjuvants Used in Ontario</i> , page 85.

¹ General re-entry. ² Hand thinning. ³ Contact and scouting activities. ⁴ Hand harvest. ⁵ Pick-your-own harvest. ⁶ Apply no later than 14 days after petal fall. ⁷ General re-entry in traditional low- to medium-density orchards. ⁸ General re-entry in high-density, trellised orchards. ⁹ Hand thinning and managing hand-line irrigation in traditional low- to medium-density orchards.

¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

* Potentially organic. Check with certifying body.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
First summer spray – 7–14 days after Petal fall (Calyx)						
European red mite, Two-spotted spider mite (cont'd)	29	Allegro 500 F	0.75–1.0 L/ha	24 hours ¹ / 72 hours ²	28 days	When used to control listed diseases, may provide mite suppression.
	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	European red mite only. Suppression only. See comments for this product for European red mite at Half-inch green to tight cluster .
		Vegol Crop Oil *	2% v/v	12 hours	0 days	See comments for this product for European red mite at Half-inch green to tight cluster .
	UN	Acramite 50 WS	568 g/ha (2.5 pouches/ha) or 851 g/ha (3.75 pouches/ha)	12 hours	7 days	Apply when there are 5–7 active mites per leaf. Use low rate for two-spotted spider mite and high rate for European red mite.
Rosy apple aphid	Use one of the products listed for Rosy apple aphid at Petal fall (calyx) . At this timing, Clutch 50 WDG applied at 210–420 g/ha provides suppression of oriental fruit moth and codling moth.					
Codling moth (first generation)	General Comments: • Apply as a full cover spray. • Use pheromone traps to time sprays. Apply insecticides between the specified degree-days (DDC, base 10°C) after first sustained moth catch. For information on calculating degree days, see Appendix B: <i>Degree-Day Modeling</i>, page 428.					
	1B	Imidan WP	2.68 kg/ha	7 days ^{1†} / 14 days ⁵ / 30 days ²	14 days	Apply at 138 DDC.
	4A	Assail 70 WP	170 g/ha	12 hours ¹ / 48 hours ³ / 6 days ²	7 days	Apply at 111–138 DDC. Residues last 10–14 days. Maximum of 2 applications of product from this group per season. Repeated use may result in mite outbreaks. Suppression only for Clutch.
		Calypso 480 SC	440 mL/ha	12 hours	30 days	
		Clutch 50 WDG	210–420 g/ha	12 hours	7 days	
	4C+5	TwinGuard	500 g/ha	12 hours	7 days	Apply at 138 DDC. Residues last 10–14 days. Where possible, rotate with products outside of Group 4 between generations.
	5	Delegate	420 g/ha	12 hours	7 days	Apply at 138 DDC. Residues last 10–14 days.
	18	Confirm 240 F	1 L/ha	12 hours	14 days	Apply at 83–111 DDC. Intrepid residues last 14+ days.
		Intrepid	1 L/ha	12 hours	14 days	

¹ General re-entry. ² Hand thinning. ³ Contact and scouting activities. ⁴ Hand harvest. ⁵ Pick-your-own harvest. ⁶ Apply no later than 14 days after petal fall. ⁷ General re-entry in traditional low- to medium-density orchards. ⁸ General re-entry in high-density, trellised orchards. ⁹ Hand thinning and managing hand-line irrigation in traditional low- to medium-density orchards.

¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
First summer spray – 7–14 days after Petal fall (Calyx)						
Codling moth (first generation) (cont'd)	28	Altacor	215 g/ha	12 hours	5 days	Apply at 138 DDC. Residues last 10–14 days.
		Exirel	500–750 mL/ha	12 hours	3 days	Apply at 83–111 DDC. Residues last 10–14 days. Do not tank-mix or make sequential applications with strobilurin, copper or captan fungicides. See product label for other tank-mix restrictions.
	NC	CYD-X	250 mL/ha	12 hours	0 days	May provide control of codling moth when used in conjunction with other active ingredients. Virus must be ingested to be effective. After death, larvae will disintegrate and release new viral bodies which may infect other codling moth larvae. Apply in late afternoon or on a cloudy day to avoid exposure to sunlight. Reapply every 7–14 days. Target early egg hatch.
		Virosoft CP-4 *	250 mL/ha	12 hours	—	
Fruitlet thinning	General Comments: • Note the preharvest intervals for early maturing cultivars. • See Table 2–9. <i>Suggested Rates for Chemical Thinning of Mature Apple Trees</i>, page 87. • Visit ontario.ca/apples and click on <i>Hand and Chemical Thinning in Tree Fruit</i> for more information.					
	Use one of the products listed for Fruitlet thinning at Petal fall (calyx) and/or the following:					
	NC	Sevin XLR	0.5–2.0 L / 1,000 L water	12 hours ⁷ / 4 days ⁸ / 10 days ⁹ / 14 days ¹⁰ / 17 days ¹¹	75 days	Apply 7–12 days after petal fall (7 days if warm and 12 days if cool). Can be applied up to 21 days after petal fall if conditions are less than ideal. There will be little to no increase in thinning effectiveness at concentrations higher than 2 L/1,000 L water. Apply as a dilute spray under slow drying conditions between 21–24°C. Chemical-resistant gloves are recommended when hand thinning following application.
		Sevin XLR plus Cilis Plus or MaxCel	1–2 L/1,000 L water plus 2.5–6.3 L/1,000 L water or 2.65–6.6 L/1,000 L water	12 hours ⁷ / 4 days ⁸ / 10 days ⁹ / 14 days ¹⁰ / 17 days ¹¹	75 days/ 86 days ¹²	Use for difficult-to-thin cultivars or for situations where aggressive thinning is required to decrease crop load. See Table 2–10. <i>Suggested Rates of MaxCel or Cilis Plus to Use With or Without Sevin XLR</i> , page 88.
Sevin XLR plus Fruitone-L		1 L/1,000 L water plus 97–480 mL/1,000 L water	12 hours ⁷ / 4 days ⁸ / 10 days ⁹ / 14 days ¹⁰ / 17 days ¹¹	75 days	Use on hard-to-thin cultivars such as Paula Red, Golden Delicious, Fuji and Gala strains.	

¹ General re-entry. ² Hand thinning. ³ Contact and scouting activities. ⁴ Hand harvest. ⁵ Pick-your-own harvest. ⁶ Apply no later than 14 days after petal fall. ⁷ General re-entry in traditional low- to medium-density orchards. ⁸ General re-entry in high-density, trellised orchards. ⁹ Hand thinning and managing hand-line irrigation in traditional low- to medium-density orchards.

¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Subsequent summer sprays						
Scab	General Comments: If scab is controlled in your orchard, use the lower rate given in brackets.					
	Until the end of the primary scab season, use one of the products listed for Scab at Bloom . For summer (secondary) scab control, use one of the following, particularly when conditions are conducive to disease development:					
	M	Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	May cause russetting of light-skinned cultivars. Use a 0.8% solution if fruit is present. If concerned about sensitivity of fruit, test first on a small area.
		Dithane Rainshield or Manzate Pro-stick or Penncozeb 75 Raincoat	2 kg/1,000 L water (1.5) 6 kg/ha (5) 2 kg/1,000 L water (1.5)	12 hours 24 hours 24 hours	45 days	Check preharvest interval before spraying early maturing cultivars.
		Folpan 80 WDG	3.0–3.75 kg/ha	24 hours	—	May cause russetting to Delicious or other sensitive cultivars when used pink to 30 days after petal fall. Do not use within 14 days of oil.
		Granuflo-T	1.5–2.25 kg/1,000 L water (1.0–1.5)	24 hours	28 days	No product specific comments.
		Maestro 80 DF or Supra Captan 80 WDG	3.75 kg/ha (1.9)	48 hours	7 days	Do not use within 14 days of oil or as a tank-mix or sequential application with products containing oil such as Fontelis or Exirel.
		Polyram DF	6 kg/ha (4.5)	12 hours	45 days	Check preharvest interval before spraying early maturing cultivars.
	29	Allegro 500 F	0.5–1.0 L/ha	24 hours ¹ / 72 hours ²	28 days	In orchards with high disease pressure or susceptible cultivars, use high rate. Do not mix with oil. May provide mite suppression.
Sooty blotch, Fly speck	General Comments: Begin fungicide coverage for these diseases at Petal fall (calyx) if fly speck and sooty blotch were a problem in the past.					
	M	Folpan 80 WDG	3.0–3.75 kg/ha	24 hours	—	May cause russetting to Delicious or other sensitive cultivars when used pink to 30 days after petal fall. Do not use within 14 days of oil.
		Granuflo-T	1.5–2.25 kg/1,000 L water	24 hours	28 days	No product specific comments.
		Maestro 80 DF or Supra Captan 80 WDG	3.75 kg/ha	48 hours	7 days	Reapply 2 weeks later. At full rates, these products protect against fruit rot. Do not use within 14 days of oil or as a tank-mix or sequential application with products containing oil such as Fontelis or Exirel.
	3+7	Aprovia Top 195 EC	643 mL/ha	12 hours	30 days	Weak on fruit scab and should be tank-mixed with a protectant fungicide. See options for apple scab control at Bloom .
	3+9	Inspire Super	836 mL/ha	12 hours	14 days	Weak on fruit scab and should be tank-mixed with a protectant fungicide. See options for apple scab control at Bloom .

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¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Subsequent summer sprays						
Sooty blotch, Fly speck (cont'd)	7+11	Pristine WG	600–800 g/ha	when dry ¹ / 5 days ⁴ / 12 days ²	5 days	Weak on fruit scab and should be tank-mixed with a protectant fungicide. See options for apple scab control at Bloom . Do not tank-mix or make sequential applications with Exirel.
	11	Flint	140 g/ha	12 hours ¹ / 4 days ²	14 days	Weak on fruit scab and should be tank-mixed with a protectant fungicide. See options for apple scab control at Bloom . Do not tank-mix or make sequential applications with Exirel.
	29	Allegro 500 F	0.5–1.0 L/ha	24 hours ¹ / 72 hours ²	28 days	In orchards with high disease pressure or susceptible cultivars, use high rate. Do not mix with oil. May provide mite suppression.
	33	Phostrol	4.4 L/ha	12 hours	1 day	Reapply on a 7–14-day interval if conditions are conducive to disease development. Use shorter interval under higher disease pressure or on susceptible cultivars.
	P5	Regalia Maxx *	0.125% v/v in 1,000 L water/ha	when dry	0 days	Suppression only. Reapply every 7–10 days if conditions are conducive to disease development.
Codling moth (second generation)	General Comments: • Use pheromone traps to time sprays. Apply insecticides within specified degree-days (DDC, base 10° C) after first-generation sustained moth catch. For information on calculating degree days, see Appendix B: <i>Degree-Day Modeling</i>, page 428. • With the exception of Imidan, do not use these products as a border spray. Efficacy of this application method is unknown.					
	1B	Imidan WP	2.68 kg/ha	7 days ^{1†} / 14 days ⁵ / 30 days ²	14 days	Apply at 667–694 DDC. Residues last 18–21 days. At this timing, Imidan may be effective as a border spray if there is no resident population in the orchard.
	4A	Assail 70 WP	170 g/ha	12 hours ¹ / 48 hours ³ / 6 days ²	7 days	Apply at 639–667 DDC. Residues last 10–14 days. Use a maximum of 2 applications of products from this group per season. Repeated use may result in mite outbreaks.
		Calypso 480 SC	440 mL/ha	12 hours	30 days	
	4C+5	TwinGuard	500 g/ha	12 hours	7 days	Apply at 667–694 DDC. Residues last 10–14 days. Where possible, rotate with products outside of Group 4 between generations.
	5	Delegate	420 g/ha	12 hours	7 days	Apply at 667–694 DDC. Residues last 10–14 days.
	18	Confirm 240 F	1 L/ha	12 hours	14 days	Apply at 611–639 DDC. Intrepid residues last 14+ days.
		Intrepid	1 L/ha	12 hours	14 days	
	28	Altacor	215 g/ha	12 hours	5 days	Apply at 667–694 DDC. Residues last 10–14 days. Do not tank-mix or make sequential applications of Exirel with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
		Exirel	500–750 mL/ha	12 hours	3 days	

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¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Subsequent summer sprays						
Codling moth (second generation) (cont'd)	NC	CYD-X	250 mL/ha	12 hours	0 days	May provide control of codling moth when used in conjunction with other active ingredients. Virus must be ingested to be effective. After death, larvae will disintegrate and release new viral bodies which may infect other codling moth larvae. Apply in late afternoon or on a cloudy day to avoid exposure to sunlight. Reapply every 7–14 days. Target early egg hatch.
		Virosoft CP 4 *	250 mL/ha	12 hours	—	
Apple maggot	General Comments: • Apply 7 days after the first adult maggot is caught on a sticky board or immediately after first adult female maggot is caught on a red sphere. • Make subsequent applications at 14–21-day intervals, or as required based on monitoring. • With the exception of Imidan, do not use these products as a border spray. Efficacy of this application method is unknown.					
	1B	Imidan WP	2.68 kg/ha	7 days ^{1†} / 14 days ⁵ / 30 days ²	14 days	Residues last 18–21 days. At this timing, Imidan may be effective as a border spray if there is no resident population in the orchard.
	4A	Assail 70 WP	120–240 g/ha	12 hours ¹ / 48 hours ³ / 6 days ²	7 days	Residues last 10–14 days. Maximum of 2 applications of product from this group per season. Repeated use may result in mite outbreaks.
		Calypso 480 SC	440 mL/ha	12 hours	30 days	
	4C+5	TwinGuard	500 g/ha	12 hours	7 days	Suppression only. Residues last 10–14 days.
	5	GF-120 Fruit Fly Bait *	1.5 L in 6 L water/ha	when dry	—	Suppression only. Reapply every 7 days, or sooner if rain or overhead irrigation washes off residue. Large droplet sizes optimize the attractiveness of the bait. Proper application techniques help ensure adequate coverage. Apply using an all-terrain vehicle fitted with an appropriate sprayer and nozzle for a large spray droplet size of 4–6 mm directed to underside of leaves and inside the canopy.
	28	Altacor	285 g/ha	12 hours	5 days	Suppression only. Residues last 10–14 days.
		Exirel	1.5 L/ha	12 hours	3 days	
	NC	Surround WP *	50 kg/ha	12 hours	0 days	Begin applications well before first maggot flies are trapped in commercial orchards. Use 50 kg/ha for the first 2 applications, and continue at 7–14-day intervals using 25 kg/ha to maintain even coverage of fruit as long as flies continue to be captured. Light to moderate rain will help distribute product. Reapply after heavy rain, strong wind or overhead irrigation. White film will remain on fruit if applied near harvest unless crop will be washed and waxed. May delay sugar accumulation. Do not use with anti-foaming agents, white mineral particulate products, spreader/stickers or summer oils.

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¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Special summer sprays (when monitoring indicates the need)						
Leafcurling midge	Use one of the products listed for Leafcurling midge at Petal fall (Calyx) . See Table 2–2. <i>Activity of Insecticides and Miticides on Apple Pests</i> , page 70, for efficacy of products. Continue monitoring and apply an insecticide shortly after upswing in pheromone trap catches or when yellow eggs are found in newest unfurled leaves. Generations begin to overlap as season progresses, making control more difficult.					
Brown marmorated stink bug	General Comments: • This pest has been detected in orchards, but not at economically damaging levels. Check the OMAFRA website at ontario.ca/stinkbug for updates on pest development, registered products and management strategies. • There are currently no thresholds established. Apply when insects are first detected or early damage found. • Pheromone traps are commercially available. • These products are toxic to beneficial insects and should be used only when necessary.					
	1A	Lannate Toss-N-Go	2.1 kg/ha	12 hours ¹ / 5 days ²	8 days	Do not apply to Early McIntosh, Wealthy or Summer Glo cultivars.
	4A	Actara 25 WG	385 g/ha	12 hours	60 days	Suppression only. Check preharvest interval before spraying early maturing cultivars.
		Clutch 50 WDG	210–420 g/ha	12 hours	7 days	Suppression only.
Green apple aphid, Rosy apple aphid	General Comments: • For rosy apple aphid, spray if 20% of clusters are infested. • For green apple aphid, spray if 10% of terminals are infested. • Sprays can be delayed or avoided if predators are present on more than 20% of infested terminals.					
	4A	Admire 240 Flowable or Alias 240 SC	230 mL/ha	24 hours	7 days	Maximum of 2 applications of products from this group per season. Repeated use may result in mite outbreaks. Assail will also provide control of leafhoppers. Clutch applied at 210–420 g/ha provides suppression of oriental fruit moth and codling moth.
		Assail 70 WP	120 g/ha	12 hours ¹ / 48 hours ³ / 6 days ²	7 days	
		Calypso 480 SC	145–290 mL/ha	12 hours	30 days	
		Clutch 50 WDG	140–210 g/ha	12 hours	7 days	
	4C	Closer	100–200 mL/ha	12 hours	7 days	Where possible, rotate with products outside of Group 4.
	4C+5	TwinGuard	250 g/ha	12 hours	7 days	Where possible, rotate with products outside of Group 4.
	4D	Sivanto Prime	500–750 mL/ha	12 hours	14 days	Where possible, rotate with products outside of Group 4.
	23	Movento 240 SC	365 mL/ha	12 hours	7 days	Control may not be apparent for 2–3 weeks. Under high pest pressure, reapply 2 weeks later. Tank-mix with an adjuvant/additive that has spreading and penetrating properties at a suggested rate of 0.2% v/v. See label and Table 2–8. <i>Adjuvants Used in Ontario</i> , page 85 for further details. Do not tank-mix with sulphur.

¹ General re-entry. ² Hand thinning. ³ Contact and scouting activities. ⁴ Hand harvest. ⁵ Pick-your-own harvest. ⁶ Apply no later than 14 days after petal fall. ⁷ General re-entry in traditional low- to medium-density orchards. ⁸ General re-entry in high-density, trellised orchards. ⁹ Hand thinning and managing hand-line irrigation in traditional low- to medium-density orchards.

¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Special summer sprays (when monitoring indicates the need)						
Green apple aphid, Rosy apple aphid (cont'd)	28	Exirel	1.5 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
	29	Beleaf 50 SG	160 g/ha	12 hours ¹ / 48 hours ²	21 days	No product specific comments.
	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	Rosy apple aphid only. Suppression only. See comments for this product for Rosy apple aphid at Half-inch green to tight cluster .
		Vegol Crop Oil *	2% v/v	12 hours	0 days	See comments for this product for Rosy apple aphid at Half-inch green to tight cluster .
Woolly apple aphid	General Comments: - Spray if aphid colonies are close to fruit clusters or on young trees and nursery stock. - Apply in a high-volume spray to ensure thorough coverage of trunk and limbs. - Reapply after 14 days if woolly apple aphid is still present.					
	1B	Malathion 85 E	610 mL/1,000 L water	12 hours ¹ / 48 hours ⁴ / 72 hours ²	3 days	May cause injury to McIntosh and Cortland if applied within 4 weeks of harvest.
	4C	Closer	200 mL/ha	12 hours	7 days	Suppression only. Where possible, rotate with products outside of Group 4.
	4C+5	TwinGuard	250 g/ha	12 hours	7 days	Suppression only. Where possible, rotate with products outside of Group 4.
	23	Movento 240 SC	365 mL/ha	12 hours	7 days	Control may not be apparent for 2–3 weeks. Tank-mix with an adjuvant/additive that has spreading and penetrating properties at a suggested rate of 0.2% v/v. See label and Table 2–8. <i>Adjuvants Used in Ontario</i> , page 85 for further details. Do not tank-mix with sulphur.
White apple leafhopper	General Comments: - Spray when 2–5 nymphs per leaf. Nymphs are active in mid-June and early August. - Control of adults is very difficult. - Best timing for control is after petal fall, if threshold is reached.					
	4A	Admire 240 Flowable or Alias 240 SC	200 mL/ha	24 hours	7 days	Maximum of 2 applications of products from this group per season. Repeated use may result in mite outbreaks. Clutch applied at 210–420 g/ha provides suppression of oriental fruit moth and codling moth. Assail applied at 120 g/ha for aphids will also control leafhoppers.
		Calypso 480 SC	145 mL/ha	12 hours	30 days	
		Clutch 50 WDG	140–210 g/ha	12 hours	7 days	
	4D	Sivanto Prime	500–750 mL/ha	12 hours	14 days	Where possible, rotate with products outside of Group 4.
	28	Altacor	285 g/ha	12 hours	5 days	Suppression only.
		Exirel	1 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.

¹ General re-entry. ² Hand thinning. ³ Contact and scouting activities. ⁴ Hand harvest. ⁵ Pick-your-own harvest. ⁶ Apply no later than 14 days after petal fall. ⁷ General re-entry in traditional low- to medium-density orchards. ⁸ General re-entry in high-density, trellised orchards. ⁹ Hand thinning and managing hand-line irrigation in traditional low- to medium-density orchards.

¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Special summer sprays (when monitoring indicates the need)						
Potato leafhopper	General Comments: • Apply where monitoring indicates a potential problem, particularly on young trees or nursery stock. • Control of adults is very difficult.					
	4A	Calypso 480 SC	145 mL/ha	12 hours	30 days	Maximum of 2 applications of products from this group per season. Repeated use may result in mite outbreaks. Clutch applied at 210–420 g/ha provides suppression of oriental fruit moth and codling moth. Assail applied at 120 g/ha for aphids will also control leafhoppers.
		Clutch 50 WDG	140–210 g/ha	12 hours	7 days	
	4D	Sivanto Prime	500–750 mL/ha	12 hours	14 days	Where possible, rotate with products outside of Group 4.
Tentiform leafminer	General Comments: • From petal fall through to June, apply controls where there are 1 or more sap-feeding miners per leaf. • From mid to late j through July, apply where there are 2 miners per leaf (stressed trees) or 4 miners per leaf (healthy trees).					
	3	Ambush 500 EC or Perm-Up EC or Pounce 384 EC	400 mL/ha 520 mL/ha 520 mL/ha	when dry	7 days	Use is discouraged for summer generations of tentiform leafminer. Maximum of 1 application of product from this group per season. These products are highly toxic to beneficial insects and may lead to mite outbreaks.
		Decis 5 EC	250 mL/ha	12 hours	1 day	
		Mako or Up-Cyde 2.5 EC	250 mL/ha 400 mL/ha	12 hours	7 days	
		Matador 120 EC or Silencer 120 EC	83 mL/ha	24 hours	7 days	
	4A	Admire 240 Flowable or Alias 240 SC	380 mL/ha	24 hours	7 days	Maximum of 2 applications of products from this group per season. Repeated use may result in mite outbreaks. Note Calypso rate change from first to second generation. Clutch applied at 210–420 g/ha provides suppression of oriental fruit moth and codling moth.
		Assail 70 WP	80 g/ha	12 hours ¹ / 48 hours ³ / 6 days ²	7 days	
		Calypso 480 SC	290 mL/ha	12 hours	30 days	
		Clutch 50 WDG	140-210 g/ha	12 hours	7 days	
	4C+5	TwinGuard	250–500 g/ha	12 hours	7 days	Where possible, rotate with products outside of Group 4 between generations.
	5	Delegate	420 g/ha	12 hours	7 days	No product specific comments.
	28	Altacor	215 g/ha	12 hours	5 days	No product specific comments.
		Exirel	500–750 mL/ha	12 hours	3 days	Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.

¹ General re-entry. ² Hand thinning. ³ Contact and scouting activities. ⁴ Hand harvest. ⁵ Pick-your-own harvest. ⁶ Apply no later than 14 days after petal fall. ⁷ General re-entry in traditional low- to medium-density orchards. ⁸ General re-entry in high-density, trellised orchards. ⁹ Hand thinning and managing hand-line irrigation in traditional low- to medium-density orchards.

¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Special summer sprays (when monitoring indicates the need)						
Dogwood borer, Apple bark borer	General Comments: • Apply insecticides to tree trunk 7 days after peak flight of adults in orchards with a history of borer problems. • Make applications at 2-week intervals throughout the period of adult activity. • Direct the spray to the lower portion of the trunk, particularly the graft union and any pruning cuts.					
	3	Perm-Up EC plus oil or Pounce 384 EC plus oil	22 mL/100 L water plus 2 L oil	when dry	7 days	No product specific comments.
	5	Delegate	420 g/ha	12 hours	7 days	Dogwood borer only.
	15	Rimon 10 EC	1.4 L/1,000 L water	12 hours	14 days	Dogwood borer only. Do not exceed 2,000 L water/ha. May lead to mite outbreaks.
	28	Altacor	285 g/ha	12 hours	5 days	Dogwood borer only.
Apple clearwing moth	General Comments: • This is not a common pest in Ontario. • Apply insecticides to tree trunk particularly on graft union and pruning cuts within 10 days of first adult emergence. • Repeat application at 7–14-day intervals throughout the period of adult activity.					
	5	Entrust *	250 mL/ha	when dry	7 days	No product specific comments.
	15	Rimon 10 EC	1.4 L/1,000 L water	12 hours	14 days	Do not exceed 2,000 L water/ha. May lead to mite outbreaks.
Obliquebanded leafroller	General Comments: • Place pheromone traps in orchards by June to monitor adult populations. • Insecticides for summer-generation larvae should be applied at 240–280 DDC after first sustained moth catch (base 6.1°C). For information on calculating degree days, see Appendix B: <i>Degree-Day Modeling</i>, page 428.					
	4C+5	TwinGuard	500 g/ha	12 hours	7 days	If larvae activity is extended, reapply 14 days later.
	5	Delegate	420 g/ha	12 hours	7 days	If larvae activity is extended, reapply 14 days later.
		Entrust * or Success	364 mL/ha 182 mL/ha	when dry	7 days	Reapply as necessary on a 7–10-day schedule.
	11	Bioprotec CAF * or Dipel 2X DF * or Foray 48 BA	4 L/ha 1.12 kg/ha 2.8 L/ha	12 hours	0 days	Product must be consumed to be effective—spray when and where pests are actively feeding. Apply in a high-volume spray to ensure thorough coverage on both sides of the leaf. Apply to young larvae, early in infestation. Death of insect may take several days. Reapply at 5–7-day intervals if larvae activity is extended. Acidify spray mix to below pH 7.0 and apply on cloudy days or in the evening.

¹ General re-entry. ² Hand thinning. ³ Contact and scouting activities. ⁴ Hand harvest. ⁵ Pick-your-own harvest. ⁶ Apply no later than 14 days after petal fall. ⁷ General re-entry in traditional low- to medium-density orchards. ⁸ General re-entry in high-density, trellised orchards. ⁹ Hand thinning and managing hand-line irrigation in traditional low- to medium-density orchards.

¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Special summer sprays (when monitoring indicates the need)						
Obliquebanded leafroller (cont'd)	18	Confirm 240 F	1 L/ha	12 hours	14 days	Suppression only at this timing.
		Intrepid	0.75 L/ha	12 hours	14 days	
	28	Altacor	285 g/ha	12 hours	5 days	If larvae activity is extended, reapply 10 days later. Do not tank-mix or make sequential applications of Exirel with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
		Exirel	0.5–1.0 L/ha	12 hours	3 days	
Oriental fruit moth	General Comments: • This is a special spray for orchards where there is a history of damage. • Adjust spray timing based on monitoring. Apply insecticides 3–6 days after upswing in moth flight. • Alternatively, accumulate degree-days (base 7.2°C) after first sustained moth catch (biofix) of the first generation. For information on calculating degree days, see Appendix B: <i>Degree-Day Modeling</i>, page 428.					
	3	Decis 5 EC	250 mL/ha	12 hours	1 day	For second generation, apply at 805–833 DDC. For third generation, apply at 1361–1389 DDC (1st spray) and 1611–1667 DDC (2nd spray). Highly toxic to beneficial insects and may lead to mite outbreaks. Use only as a last resort. Apply in 3,000 L water.
	4A	Assail 70 WP	240 g/ha	12 hours ¹ / 48 hours ³ / 6 days ²	7 days	For second generation, apply at 750–778 DDC. For third generation, apply at 1305–1333 DDC (1st spray) and 1556–1611 DDC (2nd spray).
		Calypso 480 SC	440 mL/ha	12 hours	30 days	
	4C+5	TwinGuard	500 g/ha	12 hours	7 days	For second generation, apply at 805–833 DDC. For third generation, apply at 1361–1389 DDC (1st spray) and 1611–1667 DDC (2nd spray). Where possible, rotate with products outside of Group 4 between generations.
	5	Delegate	420 g/ha	12 hours	7 days	For second generation, apply at 805–833 DDC. For third generation, apply at 1361–1389 DDC (1st spray) and 1611–1667 DDC (2nd spray).
	18	Intrepid	1 L/ha	12 hours	14 days	For second generation, apply at 750–778 DDC. For third generation, apply at 1305–1333 DDC (1st spray) and 1556–1611 DDC (2nd spray).
	28	Altacor	215 g/ha	12 hours	5 days	For second generation, apply at 805–833 DDC. For third generation, apply at 1361–1389 DDC (1st spray) and 1611–1667 DDC (2nd spray). Do not tank-mix or make sequential applications of Exirel with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
		Exirel	500–750 mL/ha	12 hours	3 days	

¹ General re-entry. ² Hand thinning. ³ Contact and scouting activities. ⁴ Hand harvest. ⁵ Pick-your-own harvest. ⁶ Apply no later than 14 days after petal fall. ⁷ General re-entry in traditional low- to medium-density orchards. ⁸ General re-entry in high-density, trellised orchards. ⁹ Hand thinning and managing hand-line irrigation in traditional low- to medium-density orchards.

¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Special summer sprays (when monitoring indicates the need)						
European red mite	General Comments: • Presence of beneficial insects should be considered before applying a spray. For more information on beneficial insects, see ontario.ca/cropipm. • Thorough spray coverage is essential for good control. Use a minimum of 1,000 L/ha of water when applying summer miticides. See Table 2–6. <i>Activity of Miticides Registered on Apple and/or Pear in Ontario</i>, page 83. • Miticides are best applied alone. • For resistance management, do not use more than once per season.					
	20	Kanemite 15 SC	2.1 L/ha	12 hours ¹ / 5 days ²	14 days	Apply when there are 7–10 active mites per leaf in June to mid-July or 10–15 active mites per leaf in July and August.
	21	Nexter	300 g/ha	24 hours	25 days	Apply when there are 7–10 active mites per leaf in June to mid-July or 10–15 active mites per leaf in July and August. Also controls apple rust mite.
	23	Envidor 240 SC	750 mL/ha	12 hours	7 days	Apply when there are 7–10 active mites per leaf in June to mid-July or 10–15 active mites per leaf in July and August. Control may not be apparent for up to 1 week. Also controls apple rust mite.
	25	Nealta	1 L/ha	12 hours	7 days	Apply as mite populations begin to build, before mite damage is observed. The use of an adjuvant registered for use in the crop may improve performance. See Table 2–8. <i>Adjuvants Used in Ontario</i> , page 85.
	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	Suppression only. See comments for this product for European red mite at Half-inch green to tight cluster .
		Vegol Crop Oil *	2% v/v	12 hours	0 days	See comments for this product for European red mite at Half-inch green to tight cluster .
Two-spotted spider mite	UN	Acramite 50 WS	851 g/ha or 3.75 pouches/ha	12 hours	7 days	Apply when there are 7–10 active mites per leaf in June to mid-July or 10–15 active mites per leaf in July and August.
	General Comments: • Presence of beneficial insects should be considered before applying a spray. For more information on beneficial insects, see ontario.ca/cropipm. • Thorough spray coverage is essential for good control. Use a minimum of 1,000 L/ha of water when applying summer miticides. See Table 2–6. <i>Activity of Miticides Registered on Apple and/or Pear in Ontario</i>, page 83. • Miticides are best applied alone. • For resistance management, do not use more than once per season.					
	20	Kanemite 15 SC	2.1 L/ha	12 hours ¹ / 5 days ²	14 days	Apply when there are 7–10 active mites per leaf in June to mid-July or 10–15 active mites per leaf in July and August.
	21	Nexter	600 g/ha	24 hours	25 days	Controls only nymphs. Apply when there are 7–10 active mites per leaf in June to mid-July or 10–15 active mites per leaf in July and August. Also controls apple rust mite.
	23	Envidor 240 SC	750 mL/ha	12 hours	7 days	Apply when there are 7–10 active mites per leaf in June to mid-July or 10–15 active mites per leaf in July and August. Control may not be apparent for up to 1 week. Also controls apple rust mite.

¹ General re-entry. ² Hand thinning. ³ Contact and scouting activities. ⁴ Hand harvest. ⁵ Pick-your-own harvest. ⁶ Apply no later than 14 days after petal fall. ⁷ General re-entry in traditional low- to medium-density orchards. ⁸ General re-entry in high-density, trellised orchards. ⁹ Hand thinning and managing hand-line irrigation in traditional low- to medium-density orchards.

¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Special summer sprays (when monitoring indicates the need)						
Two-spotted spider mite (cont'd)	25	Nealta	1 L/ha	12 hours	7 days	Apply as mite populations begin to build, before mite damage is observed. The use of an adjuvant registered for use in the crop may improve performance. See Table 2–8. <i>Adjuvants Used in Ontario</i> , page 85.
	UN	Acramite 50 WS	568 g/ha or 2.5 pouches/ha	12 hours	7 days	Apply when there are 7–10 active mites per leaf in June to mid-July or 10–15 active mites per leaf in July and August.
Japanese beetle	General Comments: This is a sporadic pest in Ontario that can cause economic damage, especially in young plantings of Honeycrisp.					
	1B	Imidan WP	2.68 kg/ha	7 days [†] / 14 days ⁵ / 30 days ²	14 days	No product specific comments.
	4A	Calypso 480 SC	145–290 mL/ha	12 hours	30 days	No product specific comments.
	28	Altacor	285 g/ha	12 hours	5 days	Suppression only.
		Exirel	1.0–1.5 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications of Exirel with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
San Jose scale	General Comments: - Apply when the crawlers are active in orchards with a history of scale. In Ontario, the second generation crawler activity typically begins early August. - Pheromone traps for adult flight and degree-day models can be used to determine optimal spray timing. For more information, see Appendix B: <i>Degree-Day Modeling</i>, page 428. - Thorough coverage of trunk and limbs is essential for good control. - These products are toxic to bees. Do not apply when bees are active in the orchard. Refer to label for specific bee toxicity statements.					
	4C	Closer	400 mL/ha	12 hours	7 days	Reapply, if necessary, after 14 days. Where possible, rotate with products outside of Group 4.
	4C+5	TwinGuard	500 g/ha	12 hours	7 days	Reapply, if necessary, after 14 days. Where possible, rotate with products outside of Group 4 between generations.
	4D	Sivanto Prime	0.75–1.0 L/ha plus 0.25% v/v oil	12 hours	14 days	If using oil, may cause bark injury on some cultivars, such as Red Delicious, Empire and Mutsu/Crispin. Do not use oil within 14 days of Supra Captan, Maestro, Folpan or sulphur. Do not apply when temperatures exceed 30°C, to crops under moisture stress or just prior to rain. Reapply, if necessary, after 14 days. Where possible, rotate with products outside of Group 4.
	23	Movento 240 SC	365 mL/ha	12 hours	7 days	Control may not be apparent for 2–3 weeks. Apply 1–2 weeks before expected crawler emergence. Under high pest pressure, reapply 2 weeks later. Tank-mix with an adjuvant/additive that has spreading and penetrating properties at a suggested rate of 0.2% v/v. See label and Table 2–8. <i>Adjuvants Used in Ontario</i> , page 85 for further details. Do not tank-mix with sulphur.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Special summer sprays (when monitoring indicates the need)						
Fire blight	General Comments: • Products do not have activity on infected shoots but rather help prevent spread to other susceptible tissue. • Prune out infected shoots where possible and apply preventative spray after. • Apply within 24 hours of trauma event such as hail, strong winds or heavy rain.					
	M	Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	May cause russetting of light-skinned cultivars. Use a 0.8% solution if fruit is present. If concerned about sensitivity of fruit, test first on a small area. Reapply every 3–7 days if conditions favour disease development.
	44	Double Nickel LC *	5.0–7.5 L/ha	when dry	0 days	Suppression only. Reapply every 3–7 days if conditions favour disease development. Can be mixed with copper fungicides to improve control.
Blister spot	Use one of the products listed for Blister spot in First summer spray .					
Pinpoint and storage scab	Use one of the products listed for secondary Scab in Subsequent summer sprays . Do not use fungicides closer than the stated preharvest interval. See Table 2–1. <i>Products Used on Apples</i> , page 64.					
Preharvest sprays						
Botrytis grey mould, Penicillium storage diseases	9	Scala SC	2 L/ha	12 hours ¹ / 24 hours ²	14 days	Suppression only. Apply 2 weeks before harvest. Summer applications of Supra Captan/Maestro may provide some protection against storage rots.
Fruit colour	General Comments: • Visit ontario.ca/apples and click on <i>Plant Growth Regulators for Fruit Crops</i> for more information.					
	NC	Ethrel	0.75–3.5 L/ha	2 days	—	Apply 2–3 weeks before the normal harvest date. Depending on the cultivar and air temperature, fruit will be ready to harvest 5–10 days after application. Check maturity daily. On early cultivars like Jerseymac and Paulared, use 0.75–1.5 L/ha. McIntosh requires 1.5–3.5 L/ha. Use high rate early season on trees high in nitrogen or on poorly pruned trees. Fruit should be marketed immediately. Stimulates ripening and fruit drop. Tank-mix a stop-drop product like Fruitone L (NAA) with Ethrel and reapply NAA 5 days later.
		Blush	190–381 mL/ 100 L water	when dry	7 days	Make 1–2 applications 7–28 days before anticipated harvest. If applying twice, make first application 21–28 days before harvest and reapply 7–14 days later. Begin application once red colour starts to develop. Results may vary due to cultivar and environmental conditions. Do not apply to trees under stress. Avoid application during the hottest part of the day. Apply during slow drying conditions.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Preharvest sprays						
Preharvest drop	NC	Fruitone-L or Fruit Fix Concentrate	161–646 mL/ 1,000 L water 352 mL/1,000 L water	when dry	5 days	Apply 10 ppm (322 mL of Fruitone-L/1,000 L water or 176 mL of Fruit Fix/1,000 L water) as soon as the first undamaged apples begin to drop or after the first spot pick. Effective for 7–10 days. If needed, reapply 10 ppm 5–6 days later. Maximum absorption occurs at 21–24°C with high humidity. Use a non-ionic surfactant to improve absorption. See Table 2–8. <i>Adjuvants Used in Ontario</i> , page 85. Inhibits fruit abscission but fruit continues to mature at accelerated rate. Higher concentration and number of applications increase the ripening effect. One application of single strength (10 ppm) has little effect on direct ripening. Fruit will not keep well in long-term storage, especially McIntosh. Fruit treated twice should be sold immediately. Visit ontario.ca/apples and click on <i>Plant Growth Regulators for Fruit Crops</i> .
Harvest management	General Comments: • Delay maturity by reducing ethylene production. • For more information, visit ontario.ca/apples and click on <i>Plant Growth Regulators for Fruit Crops</i>.					
	NC	ReTain	333 g (1 pouch)/0.4 ha	12 hours	7 days	For single pick harvest, apply 3–4 weeks before the anticipated normal harvest date. This will delay harvest for 7–10 days. For multiple pick harvest, apply 1–2 weeks before the anticipated normal harvest date of first pick. This will not delay the first pick but will control the maturation rate for later picks. Fruit will develop less stem-end cracking and skin greasiness. Use with an organosilicone surfactant at a rate of 0.05–0.1% v/v. See Table 2–8. <i>Adjuvants Used in Ontario</i> , page 85. Do not tank-mix with other products or apply a sun protectant product three days before or after application.
	NC	Harvista 1.3 SC	5.9–17.7 L/ha	4 hours	3 days	Harvest maturity can be delayed by 7–14 days and reduce preharvest drop, reduce fruit ethylene production, allow for additional time to develop colour and increase size, maintain fruit firmness, delay starch hydrolysis, delay onset or reduce incidence of watercore and enhance storage potential. An in-line chemical injector system, designed for use with this product, is required for application. Apply 3–21 days before anticipated harvest. Use high rate for fruit at a more advanced stage of maturity. Use low rate for bicoloured apples to prevent delay in red colour development. Use an organosilicone surfactant at a rate of 0.05% v/v. See Table 2–8. <i>Adjuvants Used in Ontario</i> , page 85. Do not apply when temperatures are above 35°C. Do not tank-mix or make sequential applications with copper.
Phytophthora crown or root rot	33	Aliette	3–5 kg/ha	when dry	30 days	Apply as foliar spray only. Do not use a drench treatment on bearing trees. Do not use more than 1,000 L/ha. Do not tank-mix with copper, adjuvants/surfactants that enhance penetration or foliar fertilizers.

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¹⁰ Hand thinning, hand harvest and managing hand-line irrigation in high-density, trellised orchards. ¹¹ Hand harvest in high-density, trellised orchards. ¹² Preharvest is 75 days for Sevin + Fruitone or Sevin + Cilis Plus, 86 days for Sevin + MaxCel. † Personal protective equipment required for certain activities. See label. — = Information is not applicable or not specified on label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Postharvest treatment						
Blue mould, Grey mould	1	Mertect SC	500 mL/500 L water	—	post-harvest	Continuous agitation is required. Does not control blue or grey mould that are resistant to benzimidazole fungicides.
	12	Scholar 230 SC	496 mL/378 L water	—	post-harvest	For use in dip tank or drencher. Treats up to 90,000 kg of fruit. For dip treatments, dip fruit for approximately 30 seconds, then allow fruit to drain.
	NC	Bio-Save 10 LP	500 g/300 L water	—	post-harvest	Suppression only of storage rots. For use in dip tank or drencher. Dip fruit for at least one minute.

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Guidelines for Protecting Non-Bearing Apple Plantings

The following program is designed to offer limited protection when needed for newly planted trees. It is not intended for protection of bearing orchards.

To minimize pest pressure, remove neglected fruit trees in the area and control weeds. Alternative materials are available as shown in the calendar for bearing fruits.

Disease, Insect	Group	Product	Rate	Product Specific Comments
Early spring				
Phytophthora crown and root rot	4	Ridomil Gold 480 SL	1 mL/tree	Apply in 5 L of water per tree, using handgun to drench trunk and soil surrounding tree. Apply before new growth begins as a thorough drench to soil around base of tree. Do not apply as a foliar spray.
	33	Aliette	5–10 g/tree	Apply in 5 L of water per tree, using handgun to drench trunk and soil surrounding tree. Use high rate for standard trees. Make first application in spring after bud break and again in early fall.
Tree growth modification	NC	Promalin SL	100–166 mL/ 500 mL latex paint	Mix with latex paint and apply directly to buds with a brush or sponge uniformly covering bark surface. Apply to 1-year-old wood only. Apply when terminal buds have started to swell, but before bud break as this may result in injury to tender side shoot tips. Notching bark above the bud with a hacksaw blade prior to treatment will greatly increase efficacy. Do not use when temperatures are below freezing, above 30°C or if rain is forecast within 6 hours. Visit ontario.ca/apples and click on <i>Plant Growth Regulators for Fruit Crops</i> .
First sprays				
Scab	General Comments: Apply fungicides before spore release as soon as green tissue is present and keep growing leaves covered. See ontario.ca/cropipm for information on infection periods.			
	M	Dithane Rainshield or Manzate Pro-stick or Penncozeb 75 Raincoat	2 kg/1,000 L water 6 kg/ha 2 kg/1,000 L water	No product specific comments.
		Folpan 80 WDG	3.0–3.75 kg/ha	Do not use within 14 days of oil.
		Granuflo T	1.5–2.25 kg/1,000 L water	No product specific comments.
		Maestro 80 DF or Supra Captan 80 WDG	3.75 kg/ha	Do not use within 14 days of oil or as a tank-mix or sequential application with products containing oil such as Fontelis or Exirel.
		Polyram DF	6 kg/ha	No product specific comments.
	3	Fullback 125 SC plus 1/2 to full rate Group M	950 mL/ha See Group M above	In conditions of rapid growth or high disease pressure, shorten intervals between applications. For resistance managements, apply a maximum of 2 applications per season.
	3+7	Aprovia Top 195 EC	386–643 mL/ha	In conditions of rapid growth or high disease pressure, use high rate and shorten intervals between applications. For resistance management, tank-mix with a compatible protectant apple scab fungicide from a different group to improve control of fruit scab. See labels for suggested tank-mix products..

* Potentially organic. Check with certifying body.

Disease, Insect	Group	Product	Rate	Product Specific Comments
First sprays				
Scab (cont'd)	7	Fontelis	1.0–1.5 L/ha	In conditions of rapid growth or high disease pressure, use high rate and shorten intervals between applications. Tank-mix with a compatible protectant apple scab fungicide from a different group. See labels for suggested tank-mix products. For resistance management, apply a maximum of 2 applications per season. Fontelis contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions. Use Sercadis with a non-ionic surfactant at a rate of 0.125% v/v (1.25 L in 1,000 L water). See Table 2–8. <i>Adjuvants Used in Ontario</i> , page 85.
		Kenja 400 SC	913 mL/ha	
		Sercadis	333 mL/ha	
	7+9	Luna Tranquility plus 1/2 to full rate Group M	800 mL/ha See Group M above	In conditions of rapid growth or high disease pressure, use high rate and shorten intervals between applications. For resistance management, apply a maximum of 2 applications per season.
	29	Allegro 500 F	0.5–1.0 L/ha	In orchards with high disease pressure or susceptible cultivars, use high rate. Do not mix with oil. May provide mite suppression.
	44	Serenade OPTI *	1.7–3.3 kg/ha	Suppression only. Apply preventatively at 7–10-day intervals. Use in conjunction with other cultural or chemical controls.
	NC	Buran *	1.8% v/v (ie., 9 L in 500 L water/ha)	Suppression only. Do not use more than 18 L/ha per application. This product should only be used as a post-infection treatment, but before 350 degree-hours (base 0°C) after beginning of infection. Apply after rainfall or when conditions are conducive to disease development. Do not apply if rain is forecast within 48 hours.
Powdery mildew	General Comments: - Begin application at Green tip to half-inch green and continue to First summer spray. Additional sprays beyond First summer spray may be needed on susceptible cultivars or if disease pressure is severe. - For resistance management, apply a maximum of 2 applications of products per fungicide group from Groups 3, 7 and 11 per season.			
	M	Cosavet DF Edge * or Microthiol Disperss *	22.5 kg/ha	May cause an increase in mite populations. Do not use within 14 days of Purespray Green Spray Oil and 30 days of Vegol Crop Oil or Superior Oil.
	3	Fullback 125 SC	585–877 mL/ha	No product specific comments.
		Nova	340 g/ha	No product specific comments.
	3+7	Aprovia Top 195 EC	643 mL/ha	No product specific comments.
	3+9	Inspire Super	836 mL/ha	Suppression only.
	7	Fontelis	1.0–1.5 L/ha	Contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
		Sercadis	167–333 mL/ha	Use with a non-ionic surfactant at a rate of 0.125 % v/v (1.25 L in 1,000 L water). See Table 2–8. <i>Adjuvants Used in Ontario</i> , page 85.
	7+9	Luna Tranquility	600 mL/ha	No product specific comments.
	7+11	Pristine WG	1.0–1.2 kg/ha	Do not tank-mix or make sequential applications with Exirel.
	11	Flint	140–210 g/ha	Do not tank-mix or make sequential applications with Exirel.
		Sovran	240 g/ha	
	44	Serenade OPTI *	1.7–3.3 kg/ha	Suppression only. Apply preventatively at 7–10-day intervals. Use in conjunction with other cultural or chemical controls.

* Potentially organic. Check with certifying body.

Disease, Insect	Group	Product	Rate	Product Specific Comments
First sprays				
Powdery mildew (cont'd)	NC	Buran *	9 L/ha	Suppression only. Control can be achieved under low to moderate disease pressure with addition of a non-ionic surfactant at a rate of 0.1% v/v. See Table 2–8. <i>Adjuvants Used in Ontario</i> , page 85. Apply in 500–800 L water/ha. Begin applications preventatively when conditions are conducive to disease development. Reapply every 7–10 days if needed. Do not apply if rain is forecast within 48 hours.
		Purespray Green Spray Oil 13 E *	10 L/1,000 L water	Suppression only. May cause bark injury to Red Delicious, Empire, Mutsu/Crispin and Ambrosia. Apply in a high-volume spray to ensure thorough coverage. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of using Supra Captan, Maestro, Folpan, Ambush, Perm-Up, Pounce or sulphur.
		Vegol Crop Oil *	2% v/v	Suppression only. May cause bark injury to Red Delicious, Empire, Mutsu/Crispin and Ambrosia. Apply in a high-volume spray to ensure thorough coverage at a rate of 2% v/v (20 L/1,000 L water). Do not apply within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of Supra Captan, Maestro, Folpan or copper and 30 days of sulphur. Do not apply to wet foliage.
	P5	Regalia Maxx *	0.125% v/v in 1,000 L water/ha	Suppression only. Do not apply until pink. Reapply every 7–10 days if conditions are conducive to disease development.
Prebloom				
Tentiform leafminer	General Comments: Monitor for tentiform leafminer and apply sprays when thresholds are reached. See comments for Tentiform leafminer at Tight cluster to pink, page 20.			
	3	Ambush 500 EC or Perm-Up EC or Pounce 384 EC	400 mL/ha 520 mL/ha 520 mL/ha	Apply at first egg hatch. Highly toxic to beneficial insects and may lead to mite outbreaks. Maximum of 1 application of product from this group per season.
		Decis 5 EC	250 mL/ha	
		Mako or Up-Cyde 2.5 EC	250 mL/ha 400 mL/ha	
	3	Matador 120 EC or Silencer 120 EC	83 mL/ha	Apply at first egg hatch. Highly toxic to beneficial insects and may lead to mite outbreaks. Maximum of 1 application of product from this group per season.
	4A	Actara 25 WG	315 g/ha	Apply when population is mainly in sap-feeder stage. Maximum of 2 applications of products from this group per season. Repeated use may result in mite outbreaks.
		Assail 70 WP	80 g/ha	
		Calypso 480 SC	145 mL/ha	
	5	Delegate	420 g/ha	Apply when population is mainly in sap-feeder stage.
	18	Confirm 240 F	1 L/ha	Apply at first egg hatch. Confirm provides suppression only .
		Intrepid	500 mL/ha	
	28	Altacor	215 g/ha	Apply when population is mainly in sap-feeder stage. Do not tank-mix or make sequential applications of Exirel with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
		Exirel	500–750 mL/ha	

* Potentially organic. Check with certifying body.

Disease, Insect	Group	Product	Rate	Product Specific Comments
Prebloom				
Spring-feeding caterpillars	General Comments: • Apply when caterpillars are small. • Not necessary if a pyrethroid (Group 3 insecticide) was used for tentiform leafminer.			
	1B	Imidan WP	2.68 kg/ha	No product specific comments.
	28	Altacor	145–285 g/ha	No product specific comments.
		Exirel	0.5–1.0 L/ha	Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
Bloom				
Fire blight	General Comments: • Avoid overstimulating growth. • Hand-pick blossoms before they open to prevent blossom infection on non-bearing trees. • See comments for Fire blight at Bloom, page 28.			
	M	Cueva	1% v/v in 470–940 L water/ha	Reapply every 3–7 days if conditions favour disease development.
	24	Kasumin 2L	5.0 L in 1,000 L water/ha	Apply at 20–30% bloom, or when conditions favour disease development. Reapply after 2–3 days if warm, wet conditions (above 18°C) are forecast. For resistance management, rotate with a different chemical group. If using lower water volumes, refer to water volume chart on label for rate recommendations.
	25	Streptomycin 17	600 g/1,000 L water	Degrades rapidly in sunlight. Reapply after 2–3 days if warm, wet conditions (above 18°C) are forecast. May provide some kickback if applied within 24 hours of infection event. For resistance management, rotate with a different chemical group.
	44	Double Nickel LC *	5.0–7.5 L/ha	Suppression only. Apply at 1–5% bloom and reapply every 3–7 days if conditions favour disease development. Can be mixed with copper fungicides to improve control.
		Serenade OPTI *	1.1–1.7 kg/ha	Suppression only. Apply at 1–5% bloom and repeat as needed if conditions favour disease development.
	NC	Blossom Protect *	See comments	For every 1 m of tree height, dilute 5.25 kg Component A in 500 L/ha water and add dilution to 0.75 kg Component B. If a forecast system is available, apply 1–2 days before an infection date. Repeat after 2 days and up to 5 times if infection continues. If no forecast system is available, apply at 10, 40, 70 and 90% open blossoms. This product is sensitive to fungicides and may have reduced efficacy if tank-mixed or applied within 2 days of certain products. See label for further details. Russetting may occur on sensitive cultivars. Do not apply more than 2 times on Golden Delicious, Idared and Jonagold or to control rat-tail blossom.
	Tree growth modification	NC	Promalin SL	63–256 mL/10 L water

* Potentially organic. Check with certifying body.

Disease, Insect	Group	Product	Rate	Product Specific Comments
Postbloom				
Leafcurling midge	General Comments: - This is a special spray for orchards where there is a history of damage. Young trees are particularly susceptible to this pest, which can reduce terminal growth. - Place pheromone traps in orchard at Pink and begin monitoring for yellow eggs in the newest unfurled leaves. Apply an insecticide shortly after upswing in pheromone trap catches or when eggs have been found, which often coincides with petal fall. - See Table 2–2. <i>Activity of Insecticides and Miticides on Apple Pests</i>, page 70, for efficacy of products.			
	3	Mako or Up-Cyde 2.5 EC	250 mL/ha 400 mL/ha	These products are highly toxic to beneficial insects and may lead to mite outbreaks. Maximum of 1 application of product from this group per season.
	23	Movento 240 SC	365–585 mL/ha	Suppression only. Control may not be apparent for 2–3 weeks. Under high pest pressure, use high rate and reapply 2 weeks later. Tank-mix with an adjuvant/additive that has spreading and penetrating properties at a suggested rate of 0.2% v/v. See label and Table 2–8. <i>Adjuvants Used in Ontario</i> , page 85 for further details. Do not tank-mix with sulphur.
Tree growth modification	Use one of the products listed under Tree growth modification at Bloom .			
Enhanced bloom	NC	Ethrel	2.0–4.25 L/1,000 L water	Apply 1–2 weeks after bloom to non-bearing trees (determined by bearing trees in the area). Use low rate for spur type trees and high rate for non-spur type trees. Concentrate sprays can be used at rate of 7 L/500 L water for spur type trees or 14 L/500 L water for non-spur type trees. This rate may completely remove any fruit from trees, especially if applied 4 weeks after full bloom. Visit ontario.ca/apples and click on <i>Thinning of Tree Fruit</i> . For young trees just beginning to initiate flowers, see comments for this product under Enhanced bloom at Summer sprays .
Summer sprays				
Leaf-feeding insects	1B	Imidan WP	2.68 kg/ha	This spray will also control potato leafhopper.
Aphids	General Comments: - For rosy apple aphid, spray if 20% of clusters are infested. - For green apple aphid, spray if 10% of terminals are infested.			
	4A	Actara 25 WG	160 g/ha	Maximum of 2 applications of product from this group per season. Repeated use may result in mite outbreaks.
		Admire 240 Flowable or Alias 240 SC	230 mL/ha	
		Assail 70 WP	120 g/ha	
		Clutch 50 WDG	140–210 g/ha	
	4C	Closer	100–200 mL/ha	Where possible, rotate with products outside of Group 4.
	4C+5	TwinGuard	250 g/ha	Where possible, rotate with products outside of Group 4.
	23	Movento 240 SC	365 mL/ha	Control may not be apparent for 2–3 weeks. Under high pest pressure, reapply 2 weeks later. Tank-mix with an adjuvant/additive that has spreading and penetrating properties at a suggested rate of 0.2% v/v. See label and Table 2–8. <i>Adjuvants Used in Ontario</i> , page 85 for further details. Do not mix with sulphur.
	28	Exirel	1.5 L/ha	Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.

* Potentially organic. Check with certifying body.

Disease, Insect	Group	Product	Rate	Product Specific Comments
Summer sprays				
Aphids (cont'd)	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	Rosy apple aphid only. Suppression only. May cause bark injury to Red Delicious, Empire, Mutsu/Crispin and Ambrosia. Apply in a high-volume spray to ensure thorough coverage. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of Supra Captan, Maestro, Folpan, Ambush, Perm-Up, Pounce or sulphur.
		Vegol Crop Oil *	2% v/v	May cause bark injury to Red Delicious, Empire, Mutsu/Crispin and Ambrosia. Apply in a high-volume spray to ensure thorough coverage at a rate of 2% v/v (20 L/1,000 L water). Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of Supra Captan, Maestro, Folpan or copper and 30 days of sulphur. Do not apply to wet foliage.
White apple leafhopper	General Comments: - Spray when 2–5 nymphs per leaf. Nymphs are active in mid-June and early August. - Best timing is after petal fall, if threshold is reached.			
	4A	Admire 240 Flowable or Alias 240 SC	200 mL/ha	Maximum of 2 applications of product from this group per season. Repeated use may result in mite outbreaks.
		Assail 70 WP	80 g/ha	
		Calypso 480 SC	145 mL/ha	
		Clutch 50 WDG	140–210 g/ha	
	28	Altacor	285 g/ha	Suppression only.
		Exirel	1 L/ha	Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
Potato leafhopper	General Comments: This pest can cause serious economic damage to young trees or nursery stock.			
	4A	Assail 70 WP	80 g/ha	Maximum of 2 applications of products from this group per season. Repeated use may result in mite outbreaks.
		Calypso 480 SC	145 mL/ha	
		Clutch 50 WDG	140–210 g/ha	
Tentiform leafminer	General Comments: Monitor for tentiform leafminer and apply sprays when thresholds are reached. See comments for Tentiform leafminer under Special summer sprays, page 48.			
	1A	Vydate L	1.5–3.0 L/1,000 L water	Very toxic to applicator.
	4A	Actara 25 WG	315 g/ha	Maximum of 2 applications of products from this group per season. Repeated use may result in mite outbreaks.
		Admire 240 Flowable or Alias 240 SC	380 mL/ha	
		Assail 70 WP	80 g/ha	
		Calypso 480 SC	290 mL/ha	
		Clutch 50 WDG	140–210 g/ha	

* Potentially organic. Check with certifying body.

Disease, Insect	Group	Product	Rate	Product Specific Comments
Summer sprays				
Tentiform leafminer (cont'd)	4C+5	TwinGuard	250–500 g/ha	Where possible, rotate with products outside of Group 4 between generations.
	5	Delegate	420 g/ha	No product specific comments.
	28	Altacor	215 g/ha	No product specific comments.
		Exirel	500–750 mL/ha	Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
European red mite, Two-spotted spider mite	General Comments: • Presence of beneficial insects should be considered before applying a spray. For more information on beneficial insects, see ontario.ca/croppipm. • Thorough spray coverage is essential for good control. See Table 2–6. <i>Activity of Miticides Registered on Apple and/or Pear in Ontario</i>, page 83. • Miticides are best applied alone. • For resistance management, do not use more than once per season.			
	20	Kanemite 15 SC	2.1 L/ha	From petal fall to 21 days later, apply when there are 5–7 mites per leaf. Apply when there are 7–10 active mites per leaf in June to mid-July or 10–15 active mites per leaf in July and August.
	21	Nexter	300–600 g/ha	Controls nymphs and adults of European red mite but nymphs only for two-spotted spider mite. From petal fall to 21 days later, apply when there are 5–7 mites per leaf. Apply when there are 7–10 active mites per leaf in June to mid-July or 10–15 active mites per leaf in July and August. Use low rate for European red mite and high rate for two-spotted spider mite. Also controls rust mite.
	23	Envirdor 240 SC	750 mL/ha	From petal fall to 21 days later, apply when there are 5–7 mites per leaf. Apply when there are 7–10 active mites per leaf in June to mid-July or 10–15 active mites per leaf in July and August. Control may not be apparent for up to one week. Also controls rust mite.
	25	Nealta	1 L/ha	Apply as mite populations begin to build, before mite damage is observed. The use of an adjuvant registered for use in the crop may improve performance. See Table 2–8. <i>Adjuvants Used in Ontario</i> , page 85.
	UN	Acramite 50 WS	568 g/ha (2.5 pouches/ha) or 851 g/ha (3.75 pouches/ha)	From petal fall to 21 days later, apply when there are 5–7 mites per leaf. Apply when there are 7–10 active mites per leaf in June to mid-July or 10–15 active mites per leaf in July and August. Use low rate for two-spotted spider mite and high rate for European red mite.
Japanese beetle	General Comments: • This is a sporadic pest in Ontario that can cause economic damage, especially in young plantings of Honeycrisp. • Apply when damage is first detected.			
	1B	Imidan WP	2.68 kg/ha	No product specific comments.
	4A	Calypso 480 SC	145–290 mL/ha	No product specific comments.
	28	Altacor	285 g/ha	Suppression only.
		Exirel	1.0–1.5 L/ha	Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
Buffalo treehopper	Follow clean cultivation practices or remove legumes from cover crop.			

* Potentially organic. Check with certifying body.

Disease, Insect	Group	Product	Rate	Product Specific Comments
Summer sprays				
Enhanced bloom	Use one of the products listed under Enhanced bloom at Postbloom . For young trees just beginning to initiate flowers, apply 3–5 weeks after full bloom to avoid thinning and misshapen fruit.			
Fall				
Phytophthora crown and root rot	4	Ridomil Gold 480 SL	1 mL/tree	Apply in 5 L of water per tree in early fall, using handgun to drench trunk and soil surrounding tree. Do not apply as a foliar spray.
	33	Aliette	5–10 g/tree	Apply in 5 L of water per tree in early fall, using handgun to drench trunk and soil surrounding tree. Use high rate for standard trees.
Root lesion nematode	See <i>Nematodes</i> , page 387.			
* Potentially organic. Check with certifying body.				

Table 2–1. Products Used on Apples

Use this table as a guide, but refer to product label for specific information.

The **preharvest interval** is the number of days between the last spray and first harvest.

The **restricted entry interval** is the minimum interval that must be observed between when you apply the pesticide and when you work in the treated crop without protective equipment.

The **maximum applications** is the labelled maximum number or product amount applied for the growing season and may be higher than what is recommended for resistance management or for the preservation of beneficial insects.

Products listed as **potentially organic** may be acceptable for organic use based on *Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec publication Bulletin D'Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with certifying body to verify the acceptability of any product prior to using it.

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
Products used for insect and mite control or suppression							
Acramite 50 WS	27925	bifenazate	UN	7 days	12 hours	1	—
Actara 25 WG	28408	thiamethoxam	4A	60 days	12 hours	2	—
Admire 240 Flowable	24094	imidacloprid	4A	7 days	24 hours	2	—
Agri-Mek SC	31607	abamectin	6	28 days	12 hours	1	—
Alias 240 SC	28475	imidacloprid	4A	7 days	24 hours	2	—
Altacor	28981	chlorantraniliprole	28	5 days	12 hours	3 (max. 645 g/ha)	—
Ambush 500 EC	14882	permethrin	3	7 days	when dry	—	—
Apollo SC	21035	clofentezine	10	21 days ¹	12 hours ² /48 hours ⁴	1	—
Assail 70 WP	27128	acetamiprid	4A	7 days	12 hours ² /48 hours ³ / 6 days ⁴	4	—
Beleaf 50 SG	29796	flonicamid	29	21 days	12 hours ² /48 hours ⁴	3 (max. 480 g/ha)	—
Bioprotec CAF	26854	<i>Bacillus thuringiensis</i>	11	0 days	12 hours	—	✓
Calypso 480 SC	28429	thiacloprid	4A	30 days	12 hours	3 (max. 875 mL/ha)	—
Closer	30826	sulfoxaflor	4C	7 days	12 hours	2	—
Clutch 50 WDG	29382	clothianidin	4A	7 days	12 hours	2 (max. 420 g/ha)	—
Confirm 240 F	24503	tebufenozide	18	14 days	12 hours	4	—
Cyd-X	30120	<i>Cydia pomonella</i> granulovirus	NC	0 days	12 hours	—	—
Decis 5 EC	22478	deltamethrin	3	1 day	12 hours	3	—
Delegate	28778	spinetoram	5	7 days	12 hours	3	—
Dipel 2X DF	26508	<i>Bacillus thuringiensis</i>	11	0 days	12 hours	—	✓
Entrust	30382	spinosad	5	7 days	when dry	3/7 ⁵	✓

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Plant extract. U/UN = Mode of action has not been determined.

— = Information is not specified on the product label. ✓ = Potentially organic. Check with certifying body.

¹ Apply no later than 14 days after petal fall. ² General re-entry. ³ Contact and scouting activities. ⁴ Hand thinning. ⁵ Maximum 3 foliar applications per year for obliquebanded leafroller or 7 trunk applications per year for apple clearwing moth. ⁶ Pick-your-own harvest. ⁷ Hand harvest. ⁸ Maximum dormant applications per year / maximum summer applications per year. ⁹ Maximum of 2 applications per codling moth generation. ¹⁰ Depends on tank-mix partner. See label for more information. ¹¹ Traditional low- to medium-density orchard. ¹² High density, trellised orchard.

* Personal protective equipment required for certain activities. See label.

Table 2–1. Products Used on Apples (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
Products used for insect and mite control or suppression							
Envirdor 240 SC	28051	spirodiclofen	23	7 days	12 hours	1	—
Exirel	30895	cyantraniliprole	28	3 days	12 hours	4 (max. 4.5 L/ha)	—
Foray 48 BA	24978	<i>Bacillus thuringiensis</i>	11	0 days	12 hours	—	—
GF-120 Fruit Fly Bait	28336	spinosad bait	5	—	when dry	10	✓
Imidan WP	29064	phosmet	1B	14 days	7 days ² */14 days ⁶ / 30 days ⁴	5	—
Intrepid	27786	methoxyfenozide	18	14 days	12 hours	2 (max. 2 L/ha)	—
Isomate CM/OFM TT	29352	pheromone, oriental fruit moth and codling moth	NC	—	—	—	✓
Isomate DWB	30589	pheromone, dogwood borer	NC	—	—	—	—
Isomate OFM TT	31419	pheromone, oriental fruit moth	NC	—	—	—	✓
Kanemite 15 SC	28641	acequinocyl	20B	14 days	12 hours ² /5 days ⁴	2 (max. 4.1 L/ha)	—
Lannate Toss-N-Go	10868	methomyl	1A	8 days	12 hours ² /5 days ⁴	1	—
Mako	30316	cypermethrin	3	7 days	12 hours	2	—
Malathion 85 E	8372	malathion	1B	3 days	12 hours ² /48 hours ⁷ / 72 hours ⁴	2	—
Matador 120 EC	24984	lambda-cyhalothrin	3	7 days	24 hours	3	—
Movento 240 SC	28953	spirotetramat	23	7 days	12 hours	max. 1.83 L/ha	—
Nealta	31284	cyflumetofen	25	7 days	12 hours	2	—
Nexter	25135	pyridaben	21	25 days	24 hours	2	—
Perm-Up EC	28877	permethrin	3	7 days	12 hours	—	—
Pounce 384 EC	16688	permethrin	3	7 days	when dry	—	—
Purespray Green Spray Oil 13 E	27666	mineral oil	NC	—	12 hours	2/8 ⁸	✓
Rimon 10 EC	28881	novaluron	15	14 days	12 hours	2	—
Silencer 120 EC	29052	lambda-cyhalothrin	3	7 days	24 hours	3	—
Sivanto Prime	31452	flupyradifurone	4D	14 days	12 hours	2 L/ha	—

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Plant extract. U/UN = Mode of action has not been determined.

— = Information is not specified on the product label. ✓ = Potentially organic. Check with certifying body.

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* Personal protective equipment required for certain activities. See label.

Table 2–1. Products Used on Apples (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
Products used for insect and mite control or suppression							
Success	26835	spinosad	5	7 days	when dry	3	—
Superior 70 Oil	9542 14981	mineral oil	NC	—	12 hours	1 (full rate)	✓
Surround WP	27469	kaolin	NC	0 days	12 hours	—	✓
TwinGuard	31442	sulfoxaflor + spinetoram	4C+5	7 days	12 hours	2	—
Up-Cyde 2.5 EC	28795	cypermethrin	3	7 days	12 hours	3	—
Vegol Crop Oil	32408	canola oil	NC	0 days	12 hours	2/4 ⁸	✓
Virosoft CP 4	26533	<i>Cydia pomonella</i> granulovirus	NC	—	12 hours	4 ⁹	✓
Vydate L	17995	oxamyl	1A	non-bearing only	24 hours	3	—
Products used for disease control or suppression							
Aliette	27688	fosetyl al	33	30 days	when dry	3	—
Allegro 500 F	27517	fluazinam	29	28 days	24 hours ² /72 hours ⁴	9	—
Apogee	28042	prohexadione calcium	NC	45 days	12 hours	4 (max. 5.4 kg/ha)	—
Aprovia Top 195 EC	31526	difenoconazole + benzovindiflupyr	3+7	30 days	12 hours	max. 2.57 L/ha	—
Bio-Save 10 LP	29673	<i>Pseudomonas syringae</i>	NC	postharvest	—	1	—
Blossom Protect	30552	<i>Aureobasidium pullulans</i>	44	0 days	when dry	5	✓
Buran	30601	garlic powder	NC	0 days	when dry	—	✓
Copper 53 W	9934	tri-basic copper sulphate	M	30 days	48 hours	3	✓
Copper Spray	19146	copper oxychloride	M	2 days	48 hours	2	✓
Cosavet DF Edge	31869	sulphur	M	1 day	24 hours	8	✓
Cueva	31825	copper octanoate	M	1 day	4 hours	10	—
Dithane Rainshield	20553	mancozeb	M	45 days	12 hours	—	—
Double Nickel LC	31887	<i>Bacillus amyloliquefaciens</i>	44	0 days	when dry	—	✓
Ferbam 76 WDG	20136	ferbam	M	7 days	12 hours	—	—
Flint	30619	trifloxystrobin	11	14 days	12 hours ² /4 days ⁴	4 (max. 840 g/ha)	—
Folpan 80 WDG	27733	folpet	M	—	24 hours	6	—

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Table 2–1. Products Used on Apples (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
Products used for disease control or suppression							
Fontelis	30331	penthiopyrad	7	28 days	12 hours	4 (max. 4.5 L/ha)	—
Fullback 125 SC	31679	flutriafol	3	14 days	12 hours	max. 2.05 L/ha	—
Granuflo T	30548	thiram	M	28 days	24 hours	—	—
Inspire Super	30827	difenoconazole + cyprodinil	3+9	14 days	12 hours	4	—
Kasumin 2L	30591	kasugamycin	24	90 days	12 hours	4	—
Kenja 400 SC	31758	isofetamid	7	20 days	12 hours	6	—
Kumulus DF	18836	sulphur	M	1 day	24 hours	8	✓
Luna Tranquility	30510	fluopyram + pyrimethanil	7+9	14 days	12 hours ¹ /24 hours ²	4 (max. 3.2 L/ha)	—
Maestro 80 DF	26408	captan	M	7 days	48 hours	—	—
Manzate Pro-stick	28217	mancozeb	M	45 days	24 hours	—	—
Mertect SC	13975	thiabendazole	1	postharvest	—	—	—
Microscopic Sulphur WP	14653	sulphur	M	1 day	24 hours	8	✓
Microthiol Disperss	29487	sulphur	M	1 day	24 hours	8	✓
Nova	22399	myclobutanil	3	14 days	12 hours ^{2,3} /5 days ⁷ / 12 days ⁴	6	—
Penncozeb 75 DF Raincoat	30241	mancozeb	M	45 days	24 hours	—	—
Phostrol	30449	mono- and dibasic sodium, potassium and ammonium phosphites	33	1 day	12 hours	6	—
Polyram DF	20087	metiram	M	45 days	12 hours	—	—
Pristine WG	27985	boscalid + pyraclostrobin	7+11	5 days	when dry ² /5 days ⁷ / 12 days ⁴	4	—
Regalia Maxx	30199	<i>Reynoutria sachalinensis</i>	P5	0 days	when dry	—	✓
Ridomil Gold 480 SL	28474	metalaxyl-M and S	4	non-bearing only	12 hours	2	—
Scala SC	28011	pyrimethanil	9	14 days	12 hours ² /24 hours ⁴	4	—
Scholar 230 SC	29528	fludioxonil	12	postharvest	—	1	—

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* Personal protective equipment required for certain activities. See label.

Table 2–1. Products Used on Apples (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
Products used for disease control or suppression							
Senator 50 SC	32096	thiophanate-methyl	1	1 day	12 hours	max. 0.875L/ha or 1.75 L/ha ¹⁰	—
Sercadis	31697	fluxapyroxad	7	0 days	12 hours	4	—
Serenade OPTI	31666	<i>Bacillus subtilis</i>	44	0 days	when dry	—	✓
Sovran	26257	kresoxim-methyl	11	30 days	48 hours	4	—
Streptomycin 17	10305	streptomycin sulphate	25	50 days	24 hours ² /7 days ³ /14 days ⁴	3	—
Supra Captan 80 WDG	24613	captan	M	7 days	48 hours	—	—
Syllit 400 FL	28351	dodine	U12	7 days	48 hours	2	—
Thinners and plant growth regulators							
Apogee	28042	prohexadione calcium	NC	45 days	12 hours	max. 5.4 kg/ha	—
Blush	32167	prohydrojasmon	NC	7 days	when dry	2	—
Cilis Plus	29210	6-benzylaminopurine	NC	28 days	12 hours	max. 21.3 L/ha	—
Ethrel	11580	ethephon	NC	—	48 hours	—	—
Fruit Fix Concentrate	16027	1-naphthaleneacetic acid	NC	5 days	when dry	2	—
Fruitone-L	31460	1-naphthaleneacetic acid	NC	5 days	when dry	2	—
Harvista 1.3 SC	32752	1-methylcyclopropene	NC	3 days	4 hours	max. 17.7 L/ha	—
MaxCel	28851	6-benzyladenine	NC	86 days	12 hours	max. 22.5 L/ha	—
Perlan	29187	6-benzylaminopurine + gibberellins A ₄ A ₇	NC	28 days	12 hours	max. 2.4 L/ha	—
Promalin SL	16636	6-benzyladenine + gibberellins A ₄ A ₇	NC	28 days	12 hours	4	—
ReTain	25609	aviglycine hydrochloride	NC	7 days	12 hours	—	—
Sevin XLR	27876	carbaryl	1A	75 days	12 hours ^{2,11} /4 days ^{2,12} /10 days ^{4,11} /14 days ^{4,7,12} /17 days ^{7,11}	2 (max. 2.15 L/ha ¹¹ or 3.22 L/ha ¹²)	—

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* Personal protective equipment required for certain activities. See label.

Notes on Apple Insects and Diseases

Use the information in the following tables to assist with choosing the best product for the pest complex present. Consider the life stage present, history of the pest, weather and resistance management strategies, as well as the activity of each product to pests and beneficial insects.

For more information on managing pesticide resistance, see *Pest Resistance to Fungicides, Insecticides and Miticides*, page 402.

In this section:

- Table 2–2.** *Activity of Insecticides and Miticides on Apple Pests*, page 70.
- Table 2–3.** *Activity of Fungicides on Apple Diseases*, page 75.
- Table 2–4.** *Toxicity of Pesticides Honeybees and Mite/Aphid Predators*, page 77.
- Table 2–5.** *Activity of Petal Fall Insecticides Against Orchard Pests*, page 82.
- Table 2–6.** *Activity of Miticides Registered on Apple and/or Pear in Ontario*, page 83.
- Table 2–7.** *Characteristics of Apple Scab Fungicides*, page 84.

Table 2–2. Activity of Insecticides and Miticides on Apple Pests

Use products only for pests listed on the product label for the crop. The information provided in this table is intended to assist the grower in choosing the best insecticide for control of pests listed on the product label, while managing resistance and avoiding unnecessary sprays for non-target pests. Efficacy can be affected by rate of the product.

Insecticide	Apple maggot	Apple clearwing moth	Brown marmorated stink bug	Codling moth	Dogwood borer	European apple sawfly	Japanese beetle	Leafcurling midge	Mullein bug	Obliquebanded leafroller	Oriental fruit moth	Potato leafhopper	Plum curculio	San Jose scale	Spring-feeding caterpillar	Tarnished plant bug	Tentiform leafminer	White apple leafhopper	Aphids			Mites		
																			Green apple aphid	Rosy apple aphid	Woolly apple aphid	Apple rust mite	European red mite	Two-spotted spider mite
Acramite 50 WS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3 *	4 *	
Actara 25 WG ¹	2	—	3 *	1	—	2	1	—	3 *	0	1	4	3 *	0	—	3	3 *	4	4	4 *	—	0	0	0
Admire 240 Flowable ¹	2	—	2	—	—	—	1	—	3 *	—	—	4 *	—	2	—	2	4 *	4 *	4 *	4 *	2	0	0	0
Alias 240 SC ¹	2	—	2	—	—	—	1	—	3 *	—	—	4 *	—	2	—	2	4 *	4 *	4 *	4 *	2	0	0	0
Agri-Mek SC	0	0	1	0	0	0	0	—	0	0	0	3	0	—	0	0	4 * ES	3	—	—	—	3 ES	4 * ES	3 * ES
Altacor	2 *	—	1	4 *	3 *	4 *	2 *	—	—	4 *	4 *	—	1	1	4 *	1	4 *	2 *	1	1	—	0	0	0
Ambush 500 EC ¹	3 *	—	2	2 *	3 *	3	3	—	2 *	2 * R	3	3	2 *	1	3 *	4 *	3 *	3 *	2	3	1	0	0	0
Apollo SC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1 ES	3 * ES	2 * ES
Assail 70 WP ¹	3–4 *	—	3	3 *	—	3 *	4	2	3 *	1	4 *	4 *	3–4 *	2	3 *	3	4 *	4 *	4 *	4 *	2	0	0	0
Beleaf 50 SG	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	3	—	—	3 *	3 *	2 *	0	0	0
Bioprotec CAF	0	—	0	1	—	—	0	—	0	3 *	1	0	0	0	3	0	0	0	0	0	0	0	0	0

0 = Not effective. 1 = Reduction in damage or poor control. 2 = Suppression or fair control. 3 = Good control with some limitations. 4 = Excellent control.
ES = Early season applications only. R = Resistant. — = Information is unavailable. * (shaded area) = The pest is listed on the product label for control or suppression.

¹ May cause mite flare-ups.

Ratings are based on moderate insect or mite pressure. Efficacy may be affected by rate of insecticide used, as well as coverage, timing and residual of the product. In some orchards, resistance may cause control failures when present. See *Pest Resistance to Fungicides, Insecticides and Miticides*, page 402. Products must be applied at proper timings and label rates for each pest. Consult label or apple calendar for this information.

Source: Various extension publications (*Cornell Pest Management Guidelines for Tree Fruit*, *Pennsylvania Tree Fruit Production Guide*), scientific journal articles and Ontario field trials.

Table 2–2. Activity of Insecticides and Miticides on Apple Pests (cont'd)

Insecticide	Apple maggot	Apple clearwing moth	Brown marmorated stink bug	Codling moth	Dogwood borer	European apple sawfly	Japanese beetle	Leafcurling midge	Mullein bug	Obliquebanded leafroller	Oriental fruit moth	Potato leafhopper	Plum curculio	San Jose scale	Spring-feeding caterpillar	Tarnished plant bug	Tentiform leafminer	White apple leafhopper	Aphids			Mites		
																			Green apple aphid	Rosy apple aphid	Woolly apple aphid	Apple rust mite	European red mite	Two-spotted spider mite
Calypso 480 SC ¹	3 *	—	2	3 *	—	4 *	4 *	1–2	3 *	1	4 *	4 *	4 *	2	—	3	4 *	4 *	4 *	4 *	2	0	0	0
Closer ¹	0	0	2	0	0	0	0	3	0	0	0	4	0	3 *	0	3	0	4	4 *	4 *	2 *	0	0	0
Clutch 50 WDG ¹	—	—	3 *	2 *	—	—	2	—	—	1	3 *	4 *	4 *	—	1	—	4 *	4 *	4 *	4 *	—	0	0	0
Confirm 240 F	0	—	1	3 *	—	—	—	—	—	3 * R	3 ES	0	0	0	3	0	3 *	0	0	0	—	0	0	0
Cyd-X	0	0	0	4 *	0	0	0	0	0	—	3	0	0	0	—	0	—	0	0	0	0	0	0	0
Decis 5 EC ¹	3	—	—	3 *	—	3	—	2 *	1 *	2 * R	3 *	4	2	1	3 *	3	4 *	4 *	1 *	3 *	1	0	0	0
Delegate	2 *	1 *	1	4 *	3 *	—	—	2	—	4 *	4 *	—	2 *	—	4 *	—	4 *	—	0	0	—	0	0	0
Dipel 2X DF	0	—	0	1	—	—	0	—	0	3 *	1	0	0	0	3	0	0	0	0	0	0	0	0	0
Entrust	2	4 *	—	2 *	—	—	—	—	—	4 *	1	0	1	—	4 *	0	3	0	0	0	—	0	0	0
Envirdor 240 SC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4 *	4 *	4 *
Exirel	3 *	—	—	4 *	—	3 *	3 *	2	0	4 *	4 *	2	3 *	—	4 *	3	4 *	3 *	3 *	3 *	—	0	0	0
Foray 48 BA	0	—	0	1	—	—	0	—	0	3 *	1	0	0	0	3	0	0	0	0	0	0	0	0	0
Imidan WP	3–4 *	—	1	3 * R	—	3	3 *	1	—	2 * R	3 R	1	4 *	1 *	3 *	2 *	1 *	1	2 *	2 *	1	—	— *	— *

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Table 2–2. Activity of Insecticides and Miticides on Apple Pests (cont'd)

Insecticide	Apple maggot	Apple clearwing moth	Brown marmorated stink bug	Codling moth	Dogwood borer	European apple sawfly	Japanese beetle	Leafcurling midge	Mullein bug	Obliquebanded leafroller	Oriental fruit moth	Potato leafhopper	Plum curculio	San Jose scale	Spring-feeding caterpillar	Tarnished plant bug	Tentiform leafminer	White apple leafhopper	Aphids			Mites		
																			Green apple aphid	Rosy apple aphid	Woolly apple aphid	Apple rust mite	European red mite	Two-spotted spider mite
Intrepid	0	—	1	3 *	—	—	—	—	—	3 * R	3 * ES	0	0	0	3	0	3 *	0	0	0	—	0	0	0
Kanemite 15 SC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	—	4 *	4 *
Lannate Toss-N-Go	2	—	3 *	3 *	—	2	—	—	— *	3 *	3	3	2	2	3	4	3 *	3 *	2 *	2 *	1	0	0	0
Mako ¹	2 *	3 *	1	2 *	3 *	3	—	2 *	1 *	1 R	3	—	3 *	1	3 *	3 *	3 *	1 *	2	2	—	0	0	0
Malathion 85 E	2	—	2	3 *	—	3	—	—	—	1	3	1	3 *	— *	2	1	1	1	3 *	2 *	3 *	—	— *	— *
Matador 120 EC ¹	3	—	2	3 *	—	3	3	2 *	—	2 * R	3	4	2 *	1	3 *	4 *	4 *	4 *	2–3 *	2–3 *	1 *	0	0	0
Movento 240 SC	0	0	0	0	0	0	0	3 *	0	0	0	—	0	4 *	0	0	0	—	4 *	3 *	4 *	0	0	0
Nealta	0	0	0	0	0	0	0	0	0	0	0	—	0	0	0	0	0	—	0	0	0	—	4 *	4 *
Nexter	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	3	0	0	0	3 *	3 *	2 *
Perm-Up EC ¹	3 *	—	2	2 *	3 *	3	3	—	2 *	2 * R	3	3	2 *	1	3 *	4 *	3 *	3 *	2	3	1	0	0	0
Pounce 384 EC ¹	3 *	—	2	2 *	3 *	3	3	—	2 *	2 * R	3	3	2 *	1	3 *	4 *	3 *	3 *	2	3	1	0	0	0

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Ratings are based on moderate insect or mite pressure. Efficacy may be affected by rate of insecticide used, as well as coverage, timing and residual of the product. In some orchards, resistance may cause control failures when present. See *Pest Resistance to Fungicides, Insecticides and Miticides*, page 402. Products must be applied at proper timings and label rates for each pest. Consult label or apple calendar for this information.

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Table 2–2. Activity of Insecticides and Miticides on Apple Pests (cont'd)

Insecticide	Apple maggot	Apple clearwing moth	Brown marmorated stink bug	Codling moth	Dogwood borer	European apple sawfly	Japanese beetle	Leafcurling midge	Mullein bug	Obliquebanded leafroller	Oriental fruit moth	Potato leafhopper	Plum curculio	San Jose scale	Spring-feeding caterpillar	Tarnished plant bug	Tentiform leafminer	White apple leafhopper	Aphids			Mites		
																			Green apple aphid	Rosy apple aphid	Woolly apple aphid	Apple rust mite	European red mite	Two-spotted spider mite
Purespray Green Spray Oil 13 E (dormant)	0	0	0	0	0	0	0	—	0	0	0	0	0	4 *	0	0	0	0	2	2 *	—	—	4 *	—
Purespray Green Spray Oil 13 EE (summer)	—	—	—	1	—	—	—	1	—	—	1	—	—	2	—	—	1	—	2	2 *	1	2	4 *	2
Rimon 10 EC	—	3 *	1	3 *	3 *	—	—	—	—	3	3 *	2	—	—	4	3	4	2	—	—	—	0	0	0
Silencer 120 EC ¹	3	—	2	3 *	—	3	3	2 *	—	2 * R	3	4	2 *	1	3 *	4 *	4 *	4 *	2–3 *	2–3 *	1 *	0	0	0
Sivanto Prime	—	—	—	—	—	—	—	—	—	—	—	4 *	—	3 *	—	—	4 *	4 *	4 *	4 *	1	0	0	0
Success	2	4 *	—	2	—	—	—	—	—	4 *	1	0	1	—	4 *	0	3	0	0	0	—	0	0	0
Superior 70 Oil (dormant)	0	0	0	0	0	0	0	—	0	0	0	0	0	4 *	0	0	0	0	2	2	—	—	4 *	—
Surround WP	2 *	—	2	2 * ES	—	2 *	1	—	—	1 *	2 *	2 *	2 *	2	1	1 *	1	1 *	1	1	—	0	2	0

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Table 2–2. Activity of Insecticides and Miticides on Apple Pests (cont'd)

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																			Green apple aphid	Rosy apple aphid	Woolly apple aphid	Apple rust mite	European red mite	Two-spotted spider mite
TwinGuard	2 *	1	1	3 *	3	—	—	3	—	4 *	4 *	—	2 *	3 *	3	—	4 *	—	3 *	3 *	2 *	0	0	0
Up-Cyde 2.5 EC ¹	2 *	—	—	2 *	—	3	3	2 *	1	1 * R	3	—	3 *	1	3 *	3 *	3 *	1 *	2	2	—	0	0	0
Vegol Crop Oil (dormant/summer)	—	—	—	—	—	—	—	—	—	—	—	—	—	2–4 *	—	—	—	—	2 *	2 *	—	2 *	4 *	2 *
Virosoft	0	0	0	4 *	0	0	0	0	0	—	3	0	0	0	—	0	—	0	0	0	0	0	0	0
Vydate L	0	—	3	0	—	—	—	—	—	1 *	0	3	0	1	—	2 *	3 *	3 *	2 *	3 *	1 *	3 *	2 *	3 *

0 = Not effective. 1 = Reduction in damage or poor control. 2 = Suppression or fair control. 3 = Good control with some limitations. 4 = Excellent control.

ES = Early season applications only. R = Resistant. — = Information is unavailable. * (shaded area) = The pest is listed on the product label for control or suppression.

¹ May cause mite flare-ups.

Ratings are based on moderate insect or mite pressure. Efficacy may be affected by rate of insecticide used, as well as coverage, timing and residual of the product. In some orchards, resistance may cause control failures when present. See *Pest Resistance to Fungicides, Insecticides and Miticides*, page 402. Products must be applied at proper timings and label rates for each pest. Consult label or apple calendar for this information.

Source: Various extension publications (*Cornell Pest Management Guidelines for Tree Fruit*, *Pennsylvania Tree Fruit Production Guide*), scientific journal articles and Ontario field trials.

Table 2–3. Activity of Fungicides on Apple Diseases

Use fungicides only for the disease listed on the product label for the crop. The information provided in this table is intended to assist the grower in choosing the best fungicide for control of pests listed on the product label, while managing resistance and avoiding unnecessary sprays for non-target pests. Efficacy can be affected by rate of the product or by the presence of resistant populations. See *Resistance management strategies by fungicide group and disease for Ontario fruit crops*, page 394.

Group	Fungicide	Apple scab	Powdery mildew	Fire blight	Rust	Black rot	Bitter rot	Sooty blotch	Fly speck	Type of Activity
M	Copper 53 W ¹	1–2	1	2 *	1	1	1	1	1	Contact
M	Copper Spray ¹	1–2	1	2 *	1	1	1	1	1	Contact
M	Cosavet DF Edge	1–2 *	2–3 *	—	1	1	2	1–2	1–2	Contact
M	Cueva	2 *	—	2 *	—	—	—	—	—	Contact
M	Dithane Rainshield	3 *	0	—	3 *	3	3	3	3	Contact
M	Ferbam 76 WDG ¹	1–2 *	0	—	2–3 *	2 *	1 *	2 *	2 *	Contact
M	Folpan 80 WDG	2 *	—	—	—	2 *	—	2 *	2 *	Contact
M	Granuflo T	2 *	0	—	3 *	2 *	1 *	2 *	2 *	Contact
M	Kumulus DF	1–2 *	2–3 *	—	1	1	2	1–2	1–2	Contact
M	Maestro 80 DF	3–4 *	0	—	0	3–4 *	3 *	2–3 *	2 *	Contact
M	Manzate Pro-Stick	3 *	0	—	3 *	3	3	3	3	Contact
M	Microscopic Sulphur WP	1–2 *	2–3 *	—	1	1	2	1–2	1–2	Contact
M	Microthiol Disperss	1–2 *	2–3 *	—	1	1	2	1–2	1–2	Contact
M	Penncozeb 75 DF Raincoat	3 *	0	—	3 *	3	3	3	3	Contact
M	Polyram DF	3 *	0	—	4 *	3	3	4	4	Contact
M	Supra Captan 80 WDG	3–4 *	0	—	0	3–4 *	3 *	2–3 *	2 *	Contact
1	Senator 50 SC ²	3 *	3 *	—	0	3	1	4	4	Locally systemic
3	Fullback 125 SC ²	3–4 *	4 *	—	4 *	0	0	0	0	Locally systemic
3	Nova ²	3 *	4 *	—	4 *	0	0	0	0	Locally systemic

0 = No control. 1 = Poor control. 2 = Fair control. 3 = Good control, some limitations. 4 = Excellent control, few if any limitations.

— = Not registered for this disease, or information is unavailable. * (shaded area) = The pest is listed on the label for control or suppression.

M = Multi-site fungicide. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Plant extract. U = Mode of action has not been determined.

¹ May be phototoxic and cause russetting if used after early season. See label for more information. ² Rankings assume no resistance in the pathogen population in an orchard.

Contact = Stays on the surface of plant. Locally systemic = Moves into plant but does not move to other plant parts. Systemic = Moves into plant and to unsprayed plant parts as they develop.

Not all products and formulations have not been evaluated (e.g., Phostrol, Vegol Crop Oil). Contact manufacturer for more information.

Source: Various extension publications, scientific journal articles and Plant Disease Management Reports (APS).

Table 2–3. Activity of Fungicides on Apple Diseases (cont'd)

Group	Fungicide	Apple scab	Powdery mildew	Fire blight	Rust	Black rot	Bitter rot	Sooty blotch	Fly speck	Type of Activity
3+7	Aprovia Top 195 EC ²	4 *	3 *	—	3 *	—	—	3 *	3 *	Locally systemic
3+9	Inspire Super ²	4 *	2–3 *	—	4 *	0	0	3–4 *	3–4 *	Locally systemic
7	Fontelis ²	4 *	3 *	—	2–3 *	—	—	—	—	Locally systemic
7	Kenja 400 SC ²	4 *	—	—	—	—	—	—	—	Locally systemic
7	Sercadis ²	4 *	2 *	—	—	—	—	—	—	Locally systemic
7+9	Luna Tranquility ²	3–4 *	3 *	—	1	0	0	0	0	locally systemic
7+11	Pristine WG ²	3–4 *	3–4 *	—	2	3–4 *	3–4 *	3–4 *	3–4 *	Locally systemic
9	Scala SC ²	2–3 *	—	—	0	0	0	0	0	Locally systemic
11	Sovran ²	4 *	4 *	—	2	2–3	2–3	4	3	Locally systemic
11	Flint ²	4 *	4 *	—	2 *	3	2–3	4 *	3 *	Locally systemic
24	Kasumin 2L ²	—	—	3–4 *	—	—	—	—	—	Locally systemic
25	Streptomycin 17 ²	—	—	4 *	—	—	—	—	—	Locally systemic
29	Allegro 500 F	2 *	0	—	— *	1 *	3 *	3 *	3 *	Locally systemic
33	Phostrol	—	—	—	—	—	—	— *	— *	Systemic
44	Double Nickel LC	1–2	1–2	2 *	—	—	—	—	—	Contact
44	Serenade OPTI	1–2 *	1–2 *	2 *	2	—	2	2	2	Contact
NC	Blossom Protect	1–2	1–2	2–3 *	—	—	—	—	—	Contact
NC	Buran	2–3 *	2 *	—	—	—	—	—	—	Contact
NC	Purespray Green Spray Oil 13 E	0	1–2 *	—	0	0	0	0	0	Contact
P5	Regalia Maxx	1–2 *	1–2 *	1–2 *	2	2 *	1–2 *	1–2 *	1–2 *	Locally systemic
U12	Syllit 400 FL ²	3–4 *	1	—	2	0	0	1	1	Locally systemic

0 = No control. 1 = Poor control. 2 = Fair control. 3 = Good control, some limitations. 4 = Excellent control, few if any limitations.

— = Not registered for this disease, or information is unavailable. * (shaded area) = The pest is listed on the label for control or suppression.

M = Multi-site fungicide. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Plant extract. U = Mode of action has not been determined.

¹ May be phototoxic and cause russetting if used after early season. See label for more information. ² Rankings assume no resistance in the pathogen population in an orchard.

Contact = Stays on the surface of plant. Locally systemic = Moves into plant but does not move to other plant parts. Systemic = Moves into plant and to unsprayed plant parts as they develop.

Not all products and formulations have not been evaluated (e.g., Phostrol, Vegol Crop Oil). Contact manufacturer for more information.

Source: Various extension publications, scientific journal articles and Plant Disease Management Reports (APS).

Table 2–4. Toxicity of Pesticides to Honeybees and Mite/Aphid Predators

Product	Honeybees ¹	<i>Stethorus</i> adults	<i>Stethorus</i> larvae	<i>Typhlodromus pyri</i>	<i>Amblyseius fallacis</i>	<i>Zetzelia mali</i>	<i>Aphidoletes</i>	Ladybugs	Minute pirate bugs	Lacewings	Fly and wasp parasitoids
Insecticides											
Actara 25 WG	VT	VT	VT	ST	ST	NT	MT	MT	MT	MT	VT
Admire 240 Flowable	VT	MT	MT	ST	ST	NT	ST	MT	MT	MT	MT
Alias 240 SC	VT	MT	MT	ST	ST	NT	ST	MT	MT	MT	MT
Altacor	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Ambush 500 EC	VT	VT	VT	VT	VT	MT	ST	MT	MT	MT	VT
Assail 70 WP	MT	MT	MT	ST	MT	NT	MT	MT	MT	MT	VT
Beleaf 50 SG	NT	—	—	—	—	—	—	—	—	—	—
Bioprotec CAF	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Calypso 480 SC	NT	MT	MT	NT	NT	NT	ST	MT	MT	MT	VT
Closer	VT	—	—	—	—	—	—	—	—	—	—
Clutch 50 WDG	VT	VT	VT	ST	ST	NT	MT	MT	MT	MT	VT
Confirm 240 F	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
CYD-X	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Decis 5 EC	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT
Delegate	VT	ST	ST	MT	MT	ST	ST	ST	ST	ST	MT
Dipel 2X DF	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Entrust	VT	NT	NT	ST	ST	NT	NT	NT	NT	NT	ST
Exirel	VT	MT	MT	ST	ST	ST	ST	MT	ST	ST	MT

NT = Non toxic. ST = Slightly toxic. MT = Moderately toxic. VT = Very toxic. I = Irritant. — = No information is available. Consult label or manufacturer for more information.

¹ Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

² May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

³ White film barrier on plant tissue may act as a repellent to bees if used during bloom.

Adapted from *Cornell Pest Management Guidelines for Tree Fruit* and *Pennsylvania Tree Fruit Production Guide*.

Table 2–4. Toxicity of Pesticides to Honeybees and Mite/Aphid Predators (cont'd)

Product	Honeybees ¹	<i>Stethorus</i> adults	<i>Stethorus</i> larvae	<i>Typhlodromus pyri</i>	<i>Amblyseius fallacis</i>	<i>Zetzelia mali</i>	<i>Aphidoletes</i>	Ladybugs	Minute pirate bugs	Lacewings	Fly and wasp parasitoids
Insecticides											
Foray 48 BA	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
GF-120 Fruit Fly Bait	VT	NT	NT	ST	ST	NT	NT	NT	NT	NT	ST
Imidan WP	VT	ST	ST	NT	NT	NT	MT	MT	MT	MT	VT
Intrepid	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Lannate Toss-N-Go	VT	MT	MT	VT	VT	MT	VT	VT	MT	VT	VT
Mako	VT	—	—	—	—	—	—	—	—	—	—
Malathion 85 E	VT	ST	ST	NT	NT	NT	ST	MT	ST	ST	MT
Matador 120 EC	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT
Movento 240 SC	VT ²	ST	ST	NT	NT	NT	ST	ST	ST	ST	—
Perm-Up EC	VT	VT	VT	VT	VT	MT	ST	MT	MT	MT	VT
Pounce 384 EC	VT	VT	VT	VT	VT	MT	ST	MT	MT	MT	VT
Rimon 10 EC	MT ²	MT	VT	NT	NT	NT	—	VT	MT	VT	VT
Silencer 120 EC	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT	VT
Sivanto Prime	MT	MT	MT	NT	NT	NT	MT	MT	MT	MT	VT
Success	VT	NT	NT	ST	ST	NT	NT	NT	NT	NT	ST
Surround WP	I ³	MT	MT	MT	MT	MT	MT	MT	—	ST	MT
Up-Cyde 2.5 EC	VT	—	—	—	—	—	—	—	—	—	—
Virosoft CP 4	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT

NT = Non toxic. ST = Slightly toxic. MT = Moderately toxic. VT = Very toxic. I = Irritant. — = No information is available. Consult label or manufacturer for more information.

¹ Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

² May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

³ White film barrier on plant tissue may act as a repellent to bees if used during bloom.

Adapted from *Cornell Pest Management Guidelines for Tree Fruit* and *Pennsylvania Tree Fruit Production Guide*.

Table 2–4. Toxicity of Pesticides to Honeybees and Mite/Aphid Predators (cont'd)

Product	Honeybees ¹	Stethorus adults	Stethorus larvae	Typhlodromus pyri	Amblyseius fallacis	Zetzella mali	Aphidoletes	Ladybugs	Minute pirate bugs	Lacewings	Fly and wasp parasitoids
Miticides											
Acramite 50 WS	MT	NT	NT	MT	MT	MT	ST	NT	NT	NT	—
Agri-Mek SC	VT	MT	MT	MT	MT	ST	ST	ST	ST	ST	—
Apollo SC	NT	NT	NT	ST	ST	ST	NT	NT	NT	NT	—
Envior SC	MT	MT	MT	NT	NT	NT	—	—	—	—	—
Kanemite 15 SC	NT	ST	ST	ST	ST	ST	—	—	—	—	—
Nealta	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Nexter	VT	MT	MT	VT	VT	MT	MT	MT	MT	MT	—
Purespray Green Spray Oil 13 E	NT	ST	ST	MT	MT	ST	ST	ST	ST	ST	—
Superior 70 Oil	NT	ST	ST	MT	MT	ST	ST	ST	ST	ST	—
Vegol Crop Oil	NT	ST	ST	MT	MT	ST	ST	ST	ST	ST	—
Vydate L	VT	MT	MT	VT	VT	VT	MT	MT	VT	VT	VT
Fungicides											
Aliette	NT	—	—	—	—	—	—	—	—	—	—
Allegro 500 F	NT	—	—	—	—	—	—	—	—	—	—
Aprovia Top 195 EC	NT	—	—	—	—	—	—	—	—	—	—
Blossom Protect	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Buran	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Copper 53 W	NT	—	—	—	—	—	—	—	—	—	—
Copper Spray	NT	—	—	—	—	—	—	—	—	—	—

NT = Non toxic. ST = Slightly toxic. MT = Moderately toxic. VT = Very toxic. I = Irritant. — = No information is available. Consult label or manufacturer for more information.

¹ Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

² May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

³ White film barrier on plant tissue may act as a repellent to bees if used during bloom.

Adapted from *Cornell Pest Management Guidelines for Tree Fruit and Pennsylvania Tree Fruit Production Guide*.

Table 2–4. Toxicity of Pesticides to Honeybees and Mite/Aphid Predators (cont'd)

Product	Honeybees ¹	Stethorus adults	Stethorus larvae	Typhlodromus pyri	Amblyseius fallacis	Zetzelia mali	Aphidoletes	Ladybugs	Minute pirate bugs	Lacewings	Fly and wasp parasitoids
Fungicides											
Cueva	NT	—	—	—	—	—	—	—	—	—	—
Dithane Rainshield	NT	ST	ST	MT	MT	ST	—	—	—	—	—
Double Nickel LC	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Ferbam 76 WDG	NT	—	—	—	—	—	—	—	—	—	—
Flint	NT	ST	ST	NT	NT	NT	—	—	—	—	—
Folpan 80 WDG	NT	—	—	—	—	—	—	—	—	—	—
Fontelis	NT	—	—	—	—	—	—	—	—	—	—
Fullback 125 SC	MT	ST	ST	NT	NT	NT	—	—	—	—	—
Granuflo T	NT	ST	ST	ST	ST	—	—	—	—	—	—
Inspire Super	NT	ST	ST	NT	NT	NT	—	—	—	—	—
Kasumin 2L	NT	—	—	—	—	—	—	—	—	—	—
Kenja 400 SC	NT	—	—	—	—	—	—	—	—	—	—
Kumulus DF	NT	MT	MT	ST	ST	ST	—	—	—	—	—
Luna Tranquility	NT	—	—	—	—	—	—	—	—	—	—
Maestro 80 DF	MT	ST	ST	ST	ST	ST	ST	—	—	—	—
Manzate Pro-Stick	NT	ST	ST	MT	MT	ST	—	—	—	—	—
Microscopic Sulphur WP	NT	MT	MT	ST	ST	ST	—	—	—	—	—
Microthiol Disperss	NT	MT	MT	ST	ST	ST	—	—	—	—	—
Nova	NT	ST	ST	NT	NT	NT	—	—	—	—	—

NT = Non toxic. ST = Slightly toxic. MT = Moderately toxic. VT = Very toxic. I = Irritant. — = No information is available. Consult label or manufacturer for more information.

¹ Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

² May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

³ White film barrier on plant tissue may act as a repellent to bees if used during bloom.

Adapted from *Cornell Pest Management Guidelines for Tree Fruit* and *Pennsylvania Tree Fruit Production Guide*.

Table 2–4. Toxicity of Pesticides to Honeybees and Mite/Aphid Predators (cont'd)

Product	Honeybees ¹	Stethorus adults	Stethorus larvae	Typhlodromus pyri	Amblyseius fallacis	Zetzelia mali	Aphidoletes	Ladybugs	Minute pirate bugs	Lacewings	Fly and wasp parasitoids
Fungicides											
Penncozeb 75 DF Raincoat	NT	ST	ST	MT	MT	ST	—	—	—	—	—
Phostrol	NT	—	—	—	—	—	—	—	—	—	—
Polyram DF	NT	ST	ST	MT	MT	ST	—	—	—	—	—
Pristine WG	NT	ST	ST	NT	NT	NT	—	—	—	—	—
Regalia Maxx	NT	—	—	—	—	—	—	—	—	—	—
Ridomil Gold 480 SL	NT	—	—	—	—	—	—	—	—	—	—
Scala SC	NT	—	—	—	—	—	—	—	—	—	—
Senator 50 SC	NT	—	—	—	—	—	—	—	—	—	—
Sercadis	NT	—	—	—	—	—	—	—	—	—	—
Serenade OPTI	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
Sovran	NT	NT	NT	NT	NT	NT	—	—	—	—	—
Streptomycin 17	NT	—	—	—	—	—	—	—	—	—	—
Supra Captan 80 WDG	MT	ST	ST	ST	ST	ST	ST	—	—	—	—
Syllit 400 FL	NT	—	—	ST	ST	—	ST	—	—	—	—

NT = Non toxic. ST = Slightly toxic. MT = Moderately toxic. VT = Very toxic. I = Irritant. — = No information is available. Consult label or manufacturer for more information.

¹ Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

² May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

³ White film barrier on plant tissue may act as a repellent to bees if used during bloom.

Adapted from *Cornell Pest Management Guidelines for Tree Fruit and Pennsylvania Tree Fruit Production Guide*.

Table 2–5. Activity of Petal Fall Insecticides Against Orchard Pests

Use insecticides only for insects listed on the product label for the crop. Consult the label for more information. The information provided in this table is intended to assist the grower in choosing the best insecticide for control of pests listed on the product label, while managing resistance and avoiding unnecessary sprays for non-target pests. Efficacy can be affected by rate of the product.

Insecticide	Group	Obliquebanded leafroller	Oriental fruit moth	Codling moth (eggs)	Plum curculio	Mullein bug	Tentiform leafminer	Japanese beetle	European apple sawfly
Actara 25 WG	4A	—	—	—	✓ *	✓ *	✓ *	—	—
Admire 240 Flowable	4A	—	—	—	—	✓ *	✓ *	—	—
Alias 240 SC	4A	—	—	—	—	✓ *	✓ *	—	—
Assail 70 WP	4A	—	✓ *	—	✓ *	✓ *	✓ *	✓	✓ *
Calypso 240 SC	4A	—	✓ *	—	✓ *	✓ *	✓ *	✓ *	✓ *
Clutch 50 WDG	4A	—	✓s *	—	✓ *	—	✓ *	—	—
TwinGuard	4C + 5	✓ *	✓ *	—	✓ *	—	✓ *	—	—
Delegate	5	✓ *	✓ *	—	✓s *	—	✓ *	—	✓ *
Entrust	5	✓ *	—	—	—	—	✓	—	—
Success	5	✓ *	—	—	—	—	✓	—	—
Bioprotec CAF	11	✓ *	—	—	—	—	—	—	—
Dipel 2X DF	11	✓ *	—	—	—	—	—	—	—
Foray 48 BA	11	✓ *	—	—	—	—	—	—	—
Rimon 10 EC	15	✓	✓ *	✓ *	—	—	—	—	—
Intrepid	18	✓ *	✓ *	—	—	—	✓ *	—	—
Altacor	28	✓ *	✓ *	—	—	—	✓ *	✓s *	✓ *
Exirel	28	✓ *	✓ *	—	✓ *	—	✓ *	✓ *	✓ *

✓ = Has activity on the pest. s = Suppression. * (shaded area) = The pest is listed on the product label for control or suppression.

— = Pest is not registered for this product, or product does not have activity at this timing.

Table 2–6. Activity of Miticides Registered on Apple and/or Pear in Ontario¹

Product	Target Species	Life Stage(s) Affected	Preferred Timing	Comments on Knock-down
Acramite 50 WS	European red mite (apple) two-spotted spider mite (apple)	nymphs, adults	postbloom	rapid
Agri-Mek SC	European red mite two-spotted spider mite pear rust mite (pear)	nymphs	within 21 days of petal fall	rapid
Apollo SC	European red mite two-spotted spider mite	primarily eggs, newly hatched nymphs	egg stage, before >3 active mites per leaf, no later than 14 days after petal fall	slow
Envidor 240 SC	European red mite two-spotted spider mite apple rust mite (apple) pear rust mite (pear)	eggs, nymphs, adult females	postbloom	slow
Kanemite 15 SC	European red mite two-spotted spider mite	all life stages	postbloom	rapid
Nealta	European red mite two-spotted spider mite	all life stages	as mite population builds, before damage is observed	intermediate ²
Nexter	European red mite (ERM) apple rust mite (ARM) two-spotted spider mite (TSSM) pear rust mite (PRM) (pear)	nymphs and adults of ERM, ARM and PRM nymphs of TSSM no effect on eggs	summer	rapid
Purespray Green Spray Oil 13 E	European red mite	overwintering eggs, some nymphs	half-inch green to tight cluster prior to hatch	smothers eggs
Superior 70 Oil	European red mite	overwintering eggs, some nymphs	half-inch green to tight cluster prior to hatch	smothers eggs
Vegol Crop Oil	European red mite	overwintering eggs, some nymphs	half-inch green to tight cluster prior to hatch	smothers eggs

¹ Registered for use on apple or pear unless indicated otherwise. Use established thresholds to time applications. Miticides are most effective when applied alone, using recommended rates and water volumes. Apply each miticide only once per season to delay the development of resistance.

² The knock-down may be enhanced by increased coverage using a registered adjuvant. See Table 2–8. *Adjuvants Used in Ontario*, page 85

Table 2–7. Characteristics of Apple Scab Fungicides

Product	Protectant Activity (pre-infection)	Post-Infection Activity (hours) ¹	Post-Symptom Activity	Retention (50 mm rain)	Redistribution (12 mm rain)
Buran	N	350 degree hours (base 10°C)	VG	N	—
Copper 53 W	G	—	—	G	G
Copper Spray	G	—	—	G	G
Cosavet DF Edge	F	N	N	F–G	F–G
Cueva	G	—	—	G	G
Dithane Rainshield	VG	18–24	N	E *	G–VG
Ferbam WDG	G	15–20	N	G	G
Flint	VG	48–72 ²	G	E	G
Fontelis	E	48	—	E	F–G
Granuflo T	F–G	15–20	N	F–G	F–G
Inspire Super	VG	48 ²	E	VG	G
Kumulus DF	F	N	N	F–G	F–G
Luna Tranquility	E	48	—	E	F–G
Maestro 80 DF	VG	18–24	N	VG	G
Manzate Pro-Stick	VG	18–24	N	E *	G–VG
Microscopic Sulphur WP	F	N	N	F–G	F–G
Microthiol Disperss	F	N	N	F–G	F–G
Nova	F	72–96 ²	G–VG	F *	F *
Penncozeb 75 DF Raincoat	VG	18–24	N	E *	G–VG
Polyram DF	VG	18–24	N	E *	G
Scala SC	G	48–72	N	G	—
Senator 50 SC	F	18–24	VG	G	F
Sercadis	VG	48	F	E	G
Sovran	VG	48–72 ²	G	E	F *
Supra Captan 80 WDG	VG	18–24	N	VG	G
Syllit 400 FL	VG	18–24	VG	VG	G

E = Excellent. VG = Very good. G = Good. F = Fair. N = None. Values followed by * are based on field observations. — = Indicates no information is available.

¹ Maximum post-infection activity is calculated from the start of the infection period.

² Post-Infection activity of sterol inhibitor (Nova and Inspire Super) and strobilurin (Flint and Sovran) fungicides may be reduced in orchards where scab populations have shifted towards resistance.

Data is adapted from *Cornell Pest Management Recommendations for Commercial Tree Fruit Production* and work done by Szkolnik et al. (Geneva, NY) using conidia in greenhouse trials on Golden Delicious. The post-infection activity of these fungicides may not be adequate to control primary scab in commercial orchards. Do not rely solely on post-infection activity. Some products and formulations have not been evaluated (e.g., Allegro 500 F, Aprovia Top 195 EC, Cueva, Folpan 80 WDG, Fullback 125 SC, Kenja 400 SC, Pristine WG, Regalia Maxx and Serenade OPTI). Contact the manufacturer for more information.

Adjuvants Used in Fruit Crops

Spray adjuvants are tank-mix additives used to modify and enhance the effectiveness of the pesticide. They include surfactants, spreader/stickers, crop oils, anti-foaming agents, buffering agents, etc. Unless the product label specifies an adjuvant be added to the tank, growers do not need to use them.

A label may specify a particular name brand, or generalize a category of adjuvant. In the latter case, the grower is free to use any adjuvant in that category, provided it is registered for use on the crop. Always use adjuvants as directed on the product label. See Table 2–8. *Adjuvants Used in Ontario*, on this page, for common adjuvants used in fruit crops.

Table 2–8. Adjuvants Used in Ontario

Some pesticides used together or in close succession to crop oils or other adjuvants can cause crop injury. Do not use Supra Captan, Maestro, Folpan, Bravo, Echo or sulphur-based products with crop oils or adjuvants which are used to increase pesticide uptake. Crop safety issues can also occur around some formulations of copper or specific products, such as Group 11 fungicides. Read product labels closely for additional precautions around product compatibility with surfactants or crop oils. For more information on adjuvants, see sprayers101.com or Purdue Extension, *Adjuvants and the Power of the Spray* at ppp.purdue.edu/wp-content/uploads/2016/08/PPP-107.pdf.

Trade Name	Registration Number	Adjuvant Type	Characteristics
Agral 90	11809 24725	non-ionic surfactant	- wetter-spreader - compatible with most pesticides¹ - helps pesticide penetrate plant cuticle
Ipco Ag-Surf	15881	non-ionic surfactant	- wetter-spreader - compatible with most pesticides¹ - helps pesticide penetrate plant cuticle
LI 700	23026	non-ionic surfactant	- wetter-spreader - compatible with most pesticides¹ - helps pesticide penetrate plant cuticle - additional properties: pH adjuster, sticker
Purespray Green Spray Oil 13 E	27666	crop oil (mineral)	helps pesticide penetrate plant cuticle or insect exoskeleton
Xiameter OFX-0309	23078	silicone surfactant (organosilicone)	- wetter-spreader - helps pesticide penetrate plant cuticle - reduces surface tension - improves rainfastness

¹ Check product label for precautions around surfactant compatibility before using.

Thinning and Plant Growth Regulators

Thinning of fruit is critical to improving average fruit size and finish, creating uniformity in the crop, and encouraging return bloom in tree fruit. Plant growth regulators (PGRs) are chemicals used to modify tree growth and structure, remove excess fruit, improve shape and appearance or alter fruit maturity. For additional information on plant growth regulators and thinning, visit ontario.ca/apples and click on *Plant Growth Regulators for Fruit Crops* and *Thinning of Tree Fruit*.

Suggested Rates for Chemical Thinning of Apples

Chemical thinning depends on the cultivar and stage of crop development. The rates in Table 2–9. *Suggested Rates for Chemical Thinning of Mature Apple Trees*, on this page, are guidelines only. There is no substitute for personal experience. It is important to keep yearly records on weather conditions, rates,

etc., and above all, leave some trees unsprayed to help assess the thinning response. Use only one of the suggested chemical treatments. For example, with Wealthy, apply NAA or Sevin, or the combination. Before you alter or modify a treatment that has proven to be effective, seek the advice of a crop consultant.

Factors Influencing Response to Thinning

Chemical thinning depends on the cultivar and stage of crop development. See Table 2–9. *Suggested Rates for Chemical Thinning of Mature Apple Trees*, on this page, and Table 2–10. *Suggested Rates of MaxCel or Cilis Plus to Use With or Without Sevin XLR*, page 88. Response to thinning may vary due to environmental conditions (i.e., temperature, precipitation, humidity) before and after application, cultivar sensitivity, pollination and bee activity, tree age and vigour, density of foliage, spray coverage and timing of application. For more information, visit ontario.ca/apples and click on *Thinning of Tree Fruit*.

Table 2–9. Suggested Rates for Chemical Thinning of Mature Apple Trees¹

Cultivar	Sevin XLR (L/1,000 L water) ²	Fruitone (NAA) (ppm) ³	Sevin XLR (/1,000 L water) + Fruitone (NAA) (ppm) ^{2,3}	MaxCel or Cilis Plus (g BA/ha) ⁴	Sevin XLR (L/1,000 L water) + MaxCel or Cilis Plus (g BA/ha) ^{2,3,4}
Ambrosia	1–1.5	—	—	50	—
Aurora Golden Gala™	1–1.5	—	—	75	1 + 50
Braeburn	—	1.2–7.3	—	—	—
Cameo	1	2.4–9.7	—	—	—
Cortland	—	1.2–7.3	1–2 + 2.5–5	—	—
Creston	0.5–1	—	—	—	—
Crispin/Mutsu	0.5–1.5	2.4–9.7	—	—	—
Empire	1–1.5	2.4–9.7	1 + 2.5–4	50–100	1 + 50
Fuji	—	—	1–1.5 + 10–12	100–150	1–2 + 50–75

— = Treatment information not available.

¹ These rates are suggested for trees with a settled cropping history. Chemically thinning a first crop tree or immature trees is considered very risky.

² Sevin XLR is 43% active ingredient and contains 480 g or approximately 0.5 kg of carbaryl per litre. 1 L of Sevin XLR is roughly equivalent to 1 kg of Sevin 50 W.

³ Sufficient water volumes must be used to thoroughly wet trees. For actual amount of NAA, refer to the label.

⁴ Consult Table 2–10. *Suggested Rates of MaxCel or Cilis Plus to Use With or Without Sevin XLR*, page 88, to determine the actual ppm benzyladenine (BA) being applied. Concentration of BA should be no less than 50 ppm to be effective.

Table 2–9. Suggested Rates for Chemical Thinning of Mature Apple Trees¹ (cont'd)

Cultivar	Sevin XLR (L/1,000 L water) ²	Fruitone (NAA) (ppm) ³	Sevin XLR (/1,000 L water) + Fruitone (NAA) (ppm) ^{2,3}	MaxCel or Cilis Plus (g BA/ha) ⁴	Sevin XLR (L/1,000 L water) + MaxCel or Cilis Plus (g BA/ha) ^{2,3,4}
Gala	—	2.4–9.7	1 + 5–10	75–100	1–2 + 50
Gingergold	1–1.5	2.4–9.7	1 + 2.5–5	75	1 + 50
Golden Delicious, Wealthy	1–2	3.6–9.7	1 + 5–10	75–100	1–2 + 50
Golden Supreme	1	2.4–9.7	—	—	—
Goldrush	—	—	1 + 10	—	—
Honeycrisp	1–1.5	2.4–9.7	1 + 2.5	—	—
Idared	—	1.2–7.3	—	50–75	—
Jerseymac	1–1.5	2.4–9.7	—	—	—
Jonagold	1–1.5	2.4–9.7	—	50–75	—
Jonamac	—	3.6–9.7	—	—	—
Lodi	—	3.6–9.7	1 + 10–15	—	—
Macoun	—	3.6–9.7	—	—	—
McIntosh, Early	—	3.6–9.7	1 + 5–105	50–75	—
McIntosh, Non-spur	1–2	1.2–7.3	—	50	—
McIntosh, Spur-type	—	1.2–7.3	1–2 + 2.5–5	50–75	1 + 50
Northern Spy	0.5–1.5	1.2–7.3	—	—	—
Paulared	1–1.5	3.6–9.7	1 + 10–15	75	1 + 50
Red Delicious	0.5–1.5	1.2–7.3	—	—	—
Red Delicious, Spur-type	—	1.2–7.3	1–2 + 5–10	—	—
Silken	1–1.5	—	—	—	—
Spartan, Russets	1–2	2.4–9.7	1 + 10–15	—	—

— = Treatment information not available.

¹ These rates are suggested for trees with a settled cropping history. Chemically thinning a first crop tree or immature trees is considered very risky.² Sevin XLR is 43% active ingredient and contains 480 g or approximately 0.5 kg of carbaryl per litre. 1 L of Sevin XLR is roughly equivalent to 1 kg of Sevin 50 W.³ Sufficient water volumes must be used to thoroughly wet trees. For actual amount of NAA, refer to the label.⁴ Consult Table 2–10. *Suggested Rates of MaxCel or Cilis Plus to Use With or Without Sevin XLR*, page 88, to determine the actual ppm benzyladenine (BA) being applied. Concentration of BA should be no less than 50 ppm to be effective.

Table 2–10. Suggested Rates of MaxCel or Cilis Plus to Use With or Without Sevin XLR

Desired response ¹	Concentration of 6-BA (ppm) ²	Concentration of Carbaryl (ppm) ²	Number of Applications	Amount of MaxCel or Cilis Plus		Amount of Sevin XLR (L/1,000 L water/ha)
				MaxCel (L/1,000 L water/ha)	Cilis Plus (L/1,000 L water/ha)	
Enhance size only ^{3,4}	10–50	—	2 to 4	0.5–2.65	0.5–2.5	—
Mild thinning and sizing	50–75	—	1 to 2	2.65–3.95	2.5–3.75	—
Moderate thinning and sizing	75–100	—	1 to 2	3.95–5.3	3.75–5.05	—
	50–75	500	1 to 2	2.65–3.95	2.5–3.75	1
Aggressive thinning and sizing	100–150	—	1 to 2	5.3–7.95	5.05–7.55	—
	75–100	500–1,000	1 to 2	3.95–5.3	3.75–5.05	1–2
Very aggressive thinning and sizing	150–200	—	1 to 2	7.95–10.65	7.55–10.1	—
	100–125	1,000	1 to 2	5.3–6.6	5.05–6.3	2

— = Information is not available.

¹ There are several factors that influence the chemical thinning outcome. Rates are generally chosen on the degree of cultivar sensitivity to chemical thinners.

² 1 ppm is equivalent to 1 mg/L.

³ Mild thinning may occur under some conditions (weak trees, young trees, sensitive cultivars, and environmental conditions that favour the thinning response).

⁴ While 6-BA has the potential to increase cell division and enhance fruit size beyond the thinning (crop load) effect alone, this is not observed in all years because the response can be affected by spray concentration, coverage, cultivar, tree health, time of application, tree stress, and environmental conditions during and following spray application.

Calculating Parts per Million (ppm)

1 ppm = 1 g active ingredient
per 1,000 L water

Precautions

Do not apply MaxCel or Cilis Plus in combination with the hormone thinner, NAA (naphthaleneacetic acid), either as a tank-mix or separate sprays during the same growing season. Doing so may result in pygmy fruit.

Bee Warning

When Sevin is used for fruit thinning, extensive bee kills can occur if weeds or legumes are blooming in the ground cover.

To minimize bee kills, remove bees from the orchard prior to treatment. Do not spray when the wind will carry Sevin to adjacent weedy or crop areas in bloom. Advise local beekeepers of your spray activity.

Vegetative Growth Control in Apples

Patterns of terminal growth and fruit set differ among growing regions. Likewise, the response to Apogee appears to differ between regions. Therefore, the rate and calendar date of application may vary between regions. For more information, visit ontario.ca/apples and click on *Plant Growth Regulators for Fruit Crops*.

See Table 2–11. *Suggested Apogee Rates (g Apogee per ha)*, on this page, for rates. The application rate is determined primarily by tree size, vigour, and whether protection against shoot blight is an objective.

Follow the steps on the label to adjust rates for tree-row volume dilute applications. Table 2–11. *Suggested Apogee Rates (g Apogee per ha)*, on this page,

shows various rates for sprays applied at 1,000 L per ha (dilute). Apogee has been used effectively when applied in more concentrated sprays, provided thorough wetting of the canopy is achieved. Low-volume spraying of plant growth regulators and chemical thinners is not recommended.

Adjuvants and hard water

Include the spray adjuvant, Agral 90, with Apogee to improve the uptake of the prohexadione-calcium molecule by the leaf. In addition, if the spray water source is hard water and contains high levels of calcium or magnesium, include an equal amount of ammonium sulphate (AMS) fertilizer by weight with Apogee. Use a high-quality, greenhouse grade of AMS to avoid plugging of nozzles.

Table 2–11. Suggested Apogee Rates (g Apogee per ha)

Based on a tree-row volume dilute of 1,000 L/ha¹ (use this chart in conjunction with the product label).

Apogee Program Level	Tree Vigour ²	# Sprays	1st Spray Petal Fall	2nd Spray Fruit Set	3rd Spray June Drop	4th Spray Growth	Season Total ³ (g/ha)
1	low	1 spray	450	—	—	—	450
2	low	2 sprays	270	270	—	—	540
3†	medium	2 sprays	450	450	—	—	900
4	medium/high	3 sprays	450	450	270	—	1170
5	high	3 sprays	450	450	450	—	1350
6	high	4 sprays	450	450	450	270	1620

— = No activity or activity unknown.

† Suggested base rate. Move to next higher level if there is a low crop load, for fire blight suppression, or if there was heavy pruning. Visit ontario.ca/apples and click on *Plant Growth Regulators for Fruit Crops*.

¹ Tree-row volume (see sprayers101.com and *Airblast 101: A Handbook of Best Practices in Airblast Spraying* for more details). Rates need to be increased when higher water volumes are required for adequate spray coverage.

² Vigour is defined as the total amount of shoot growth in a single season, not to be confused with tree-row volume.

³ Maximum seasonal rate should not exceed a total of 5.4 kg of Apogee.

BLUEBERRY CALENDAR

In this section:

- Read the product label and follow all safety precautions. 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>.
- Consult the product label for suggested water volumes. For mature highbush blueberries, use 700–1,000 L of water per ha unless otherwise noted on the label.
- For preharvest interval, restricted entry interval and maximum number of applications, see Table 3–1. *Products Used on Blueberries*, page 107.
- **Products are listed by chemical group and in alphabetical order within each group. The order does not reflect efficacy.** See Table 3–2. *Activity of Fungicides on Blueberry Diseases and Impact on Honeybees*, page 110 and Table 3–3. *Activity of Insecticides on Blueberry Pests and Impact on Honeybees*, page 112, for efficacy ratings.
- Where a product in the calendar is followed by a “*”, it is potentially acceptable for organic use based on *Ministère de l’Agriculture, des Pêcheries et de l’Alimentation du Québec publication Bulletin D’Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with your certifying body to verify the acceptability of any product prior to using it.

Resistance Management

To delay development of resistance to fungicides, insecticides and miticides, follow resistance management guidelines outlined in *Resistance Management Strategies*, page 393. The chemical group is indicated in the column before the product name. Products belonging to the same chemical group are grouped together in the calendar. Multi-site (M) fungicides are not prone to resistance and do not have to be rotated. Some products are not classified to mode of action (NC) and the mode of action has not been determined for others (U or UN).

Fungicide resistance management

Take the following steps to avoid rapid development of fungicide resistance:

- Do not reduce rates below those specified on the label.
- Do not use products containing the same chemical group in consecutive applications.
- Use products containing only one chemical family no more than twice per season.
- Use co-formulations or products that must be tank-mixed with another chemical group no more than 3 times per season.
- Use sufficient water to provide thorough coverage.

Insecticide resistance management

Take the following steps to avoid development of insecticide resistance:

- For pests with discrete generations (obliquebanded leafroller), do not use insecticides from the same group for more than one generation. Within a generation, if more than one spray is required, use a product from the same chemical group.
- For pests with rapidly building and overlapping generations (mites, aphids), do not use products containing the same chemical group in consecutive applications.

Bee Toxicity

Some insecticides are toxic to bees and other pollinating insects. Use of insecticides on flowering crops requires careful management to avoid negative effects on pollinators. Some insecticides cannot be applied prior to or during bloom. For others, use extreme caution when applying insecticides to blueberries during bloom—do not apply them while bees are active. Before and after bloom, bees may still be present on flowering cover crops and weeds—do not allow drift of insecticides onto these or other flowering crops. Always follow label precautions regarding avoiding impacts on bees. For more information, see *Bee Poisoning*, page 5, and honeybee toxicity ratings in Table 3–2. *Activity of Fungicides on Blueberry Diseases and Impact on Honeybees*, page 110 and Table 3–3. *Activity of Insecticides on Blueberry Pests and Impact on Honeybees*, page 112.

Buffer Zones

Leave a suitable buffer zone between treatment area and adjacent sensitive areas, such as hedgerows, woodlots and freshwater habitats. Zones may vary depending on the product used, growth stage of the crop and method of application including the use of drift-reducing technology. Check the pesticide label for requirements.

Use Health Canada's online spray drift calculator to modify the buffer zone specified on the label based on weather conditions, category of spray equipment and 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. Unfortunately, this model does not account for carrier volume, travel speed or crop stage.

Observing buffer zones is a legal requirement. A record of the buffer zone modification, if any, must be retained for at least one year from the time of application.

Crop Nutrition

Crop nutrition is important for plant growth and fruit quality on berry crops. Soil testing, plant tissue analysis and visual deficiency symptoms all play an important role in assessing and monitoring the crop's nutritional status. For more information, visit <http://www.omafra.gov.on.ca/english/crops/hort/berry.html> (click on *Soil Management, Fertilizer Use, Crop Nutrition and Cover Crops for Fruit Production*) and see OMAFRA Publication 611, *Soil Fertility Handbook*. For soil testing and plant tissue analysis services, see Appendix E: *Accredited Soil-Testing Laboratories in Ontario*, page 435.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Dormant (late winter)						
Scale	General Comments: • Apply when plants are dormant. • Use 1,000–1,500 L water/ha and spray to the point of runoff.					
	M	Lime Sulphur * plus dormant oil	36.7 L/1,000 L water plus 12.5 L/1,000 L water	48 hours	dormant	Do not spray when foliage is wet.
	NC	Purespray Green Spray Oil 13 E *	20 L/1,000 L water	12 hours	dormant	Lecanium scale only (Purespray Green, Superior Oil). Apply in a high-volume spray to ensure thorough coverage. Tolerance has not been determined for all cultivars. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Supra Captan or Maestro fungicides. For Purespray Green, do not use within 10 days of Bravo or Echo fungicides. For Superior Oil and Vegol Crop Oil, do not use within 30 days of sulphur. Do not apply Vegol Crop Oil to wet foliage.
		Superior 70 Oil *	20 L/1,000 L water	12 hours	dormant	
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	
Early spring, prior to bud break						
Phytophthora root rot	General Comments: • Improve soil water drainage and adjust irrigation schedules to reduce problems with this disease.					
	4	Ridomil Gold 480 SL	37 mL/100 m of row	12 hours	80 days	Apply to the soil surface in a 1-m band centred over the row. Use at least 2,000 L water/ha. Alternatively, use Aliette at Bud swell to green tip .
Bud swell to green tip						
Leaf tiers	General Comments: • Damage from this occasional pest occurs very early in the season. • If leaf tier was a problem in the past, spray at the bud cluster stage as flower buds begin to swell and pink tissue becomes visible.					
	3	Decis 5 EC	150 mL/ha	12 hours	14 days	No product specific comments.

¹ General re-entry. ² Hand pruning. ³ Hand harvest. ⁴ Personal protective equipment required for certain activities. See label. ⁵ Pick your own harvest.

— = Information not applicable or not specified on product label. * Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Bud swell to green tip						
Obliquebanded leafroller	General Comments: - Where obliquebanded leafroller has been a problem in the past, spray if overwintering larvae are easy to find. - Alternatively, use pheromone traps to monitor for adults and spray for the summer generation at Green fruit. - Many of these products are also labelled for spanworms (known as inchworms or loopers) and other caterpillars. See product label for a complete list of registered uses.					
	5	Delegate	200 g/ha	12 hours	3 days	No product specific comments.
		Entrust * or Success	267–364 mL/ha 145–182 mL/ha	when dry	3 days	No product specific comments.
	18	Confirm 240 F	1.0 L/ha	12 hours	14 days	No product specific comments.
		Intrepid	0.5 L/ha	12 hours	7 days	No product specific comments.
	28	Altacor	285 g/ha	12 hours	1 day	No product specific comments.
		Exirel	0.5–1.0 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Supra Captan, Maestro, Bravo or Echo. See product label for numerous other tank-mix restrictions.
Mummy berry (<i>Monilinia</i>)	General Comments: - Cultivate before bud break to bury overwintering inoculum. - Monitor for trumpet-shaped structures erupting from mummified berries on the ground and spray when these are present. Spray buds and foliage to prevent primary infection of blueberry shoots. - Make the first application when the flower buds swell and repeat until first bloom.					
	3	Bumper 432 EC or Fitness or Jade or Tilt 250 E	300 mL/ha 300 mL/ha 500 mL/ha 500 mL/ha	12 hours ¹ / 5 days ^{2,3}	60 days	Use no more than 2 consecutive applications. Tank-mix with a compatible Group M fungicide. Do not use Funginex after Pink bud .
		Funginex DC	1.7–3.0 L/ha	48 hours	60 days	
		Indar	140 g/ha	12 hours	30 days	
		Proline 480 SC	315–420 mL/ha	24 hours	7 days	
		Quash	180 g/ha	12 hours ¹ / 72 hours ²	7 days	
	3+9	Inspire Super	558–836 mL/ha	12 hours	1 day	Use no more than 2 consecutive applications. Tank-mix with a compatible Group M fungicide.
	3+11	Quilt	1 L/ha	12 hours	30 days	Use no more than 2 consecutive applications. Tank-mix with a compatible Group M fungicide. Do not tank-mix or make sequential applications with Exirel.
	29	Allegro 500 F	2.24 L/ha	24 hours	30 days	Suppression only.
	44	Serenade OPTI *	2.0–3.3 kg/ha	when dry	0 days	Suppression only.

¹ General re-entry. ² Hand pruning. ³ Hand harvest. ⁴ Personal protective equipment required for certain activities. See label. ⁵ Pick your own harvest.

— = Information not applicable or not specified on product label. * Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Bud swell to green tip						
Mummy berry (<i>Monilinia</i>) (cont'd)	NC	Actinovate SP *	425–840 g/ha	1 hour	—	Suppression only. For best results, use multiple applications or rotate with other products. Do not combine with other pesticides (especially bactericides), adjuvants, surfactants or foliar fertilizers.
	P5	Regalia Maxx *	0.125%–0.25% v/v in 400–800 L water/ha	when dry	0 days	Suppression only. For best results, use multiple applications or rotate with other products. Apply 0.125% (1.25 L in 1,000 L water) or up to 0.25% (2.5 L in 1,000 L water) in rotation with other fungicides. Will also suppress alternaria fruit rot.
Phytophthora root rot	General Comments: Improve soil water drainage and adjust irrigation schedules to reduce problems with this disease.					
	33	Aliette	5.6 kg/ha	24 hours	1 day	Apply in spring when there is 7 cm of new growth and reapply 14–21 days later.
Green tip						
Anthracnose fruit rot, Phomopsis	General Comments: Apply fungicides to prevent twig blights and reduce overwintering inoculum.					
	M	Bravo ZN or Echo 90 DF	7.2 L/ha 4 kg/ha	48 hours	54 days	Will also control alternaria fruit rot. Do not use within 10 days of oil. Do not tank-mix or make sequential applications with Exirel.
	3	Quash	180 g/ha	12 hours ¹ / 72 hours ²	7 days	Suppression only (phomopsis). Control of anthracnose.
	3+9	Inspire Super	1.2–1.5 L/ha	12 hours	1 day	Anthracnose only. Use no more than 2 consecutive applications before rotating to a different fungicide group.
	7+11	Pristine WG	1.3–1.6 kg/ha	when dry ¹ / 24 hours ³	0 days	Use 1.6 kg/ha for phomopsis stem canker. Do not tank-mix or make sequential applications with Exirel.
	11	Cabrio EG	1 kg/ha	12 hours ¹ / 24 hours ³	1 day	Do not tank-mix or make sequential applications with Exirel.
	29	Allegro 500 F	2.24 L/ha	24 hours	30 days	Suppression only.
	33	Aliette	5.6 kg/ha	24 hours	1 day	Suppression only (phomopsis). Control of anthracnose. Apply at 14–21-day intervals.
		Confine Extra	4–5 L/ha	12 hours	1 day	Anthracnose only. Suppression only. Apply at 7–21-day intervals.
	NC	Botector *	1 kg in 500–2,000 L water/ha	4 hours	0 days	Anthracnose only. Suppression only. Not compatible with certain fungicides including Switch. See www.bio-ferm.com for product compatibilities. For products that are not compatible, keep a 3-day interval before and after application. Reapply as needed on a 7-10-day interval up to harvest. Avoid application when heavy rain is forecast. This is a new product in Ontario and little evidence of its efficacy is available.
	P5	Regalia Maxx *	0.25% v/v in 400–800 L water/ha	when dry	0 days	Anthracnose only. Suppression only. Will also suppress alternaria fruit rot. For best results, use multiple applications or rotate with other products.

¹ General re-entry. ² Hand pruning. ³ Hand harvest. ⁴ Personal protective equipment required for certain activities. See label. ⁵ Pick your own harvest.

— = Information not applicable or not specified on product label. * Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Green tip						
Mummy berry (Monilinia)	Use one of the products listed for Mummy berry at Bud swell to green tip .					
Pink bud						
Phytophthora root rot	33	Phostrol	2.9–5.8 L/ha	12 hours	0 days	Suppression only. May cause crop injury in the form of marginal leaf necrosis and brown spots. Apply in a high-volume spray to reduce the risk of crop injury.
Anthracnose fruit rot, Phomopsis	Use one of the products listed for Anthracnose fruit rot and phomopsis at Green tip .					
Mummy berry (Monilinia)	Use one of the products listed for Mummy berry at Bud swell to green tip .					
First bloom						
DO NOT APPLY INSECTICIDES WHILE BLUEBERRIES ARE IN BLOOM. SEE BEE POISONING, PAGE 5.						
Anthracnose fruit rot	General Comments: For anthracnose, most infections occur during bloom to green fruit, especially when weather is warm and wet.					
	3	Quash	180 g/ha	12 hours ¹ /72 hours ²	7 days	No product specific comments.
	3+9	Inspire Super	1.2–1.5 L/ha	12 hours	1 day	Use no more than 2 consecutive applications before rotating to a different fungicide group.
	3+11	Quilt	1 L/ha	12 hours	30 days	Do not tank-mix or make sequential applications with Exirel.
	7+11	Pristine WG	1.3–1.6 kg/ha	when dry ¹ /24 hours ³	0 days	Do not tank-mix or make sequential applications with Exirel.
	11	Cabrio EG	1 kg/ha	12 hours ¹ /24 hours ³	1 day	Do not tank-mix or make sequential applications with Exirel.
	9+12	Switch 62.5 WG	775–975 g/ha	12 hours	1 day	No product specific comments.
	29	Allegro 500 F	2.24 L/ha	24 hours	30 days	Suppression only.
	33	Aliette	5.6 kg/ha	24 hours	1 day	Apply at 14–21-day intervals.
		Confine Extra	4–5 L/ha	12 hours	1 day	Suppression only. Apply at 7–21-day intervals.
	P5	Regalia Maxx *	0.25% v/v in 400–800 L water/ha	when dry	0 days	Suppression only. Will also suppress alternaria fruit rot. For best results, use multiple applications or rotate with other products.
	NC	Botector *	1 kg in 500–2,000 L water/ha	4 hours	0 days	Suppression only. See comments on this product for Anthracnose at Green tip .

¹ General re-entry. ² Hand pruning. ³ Hand harvest. ⁴ Personal protective equipment required for certain activities. See label. ⁵ Pick your own harvest.

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Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
First bloom						
DO NOT APPLY INSECTICIDES WHILE BLUEBERRIES ARE IN BLOOM. SEE BEE POISONING, PAGE 5.						
Phomopsis	3	Quash	180 g/ha	12 hours ¹ / 72 hours ²	7 days	Suppression only.
	7+11	Pristine WG	1.6 kg/ha	when dry ¹ / 24 hours ³	0 days	Suppression only. Do not tank-mix or make sequential applications with Exirel.
	11	Cabrio EG	1 kg/ha	12 hours ¹ / 24 hours ³	1 day	Do not tank-mix or make sequential applications with Exirel.
	29	Allegro 500 F	2.24 L/ha	24 hours	30 days	Suppression only.
	33	Aliette	5.6 kg/ha	24 hours	1 day	Suppression only. Apply at 14–21-day intervals.
Botrytis twig and blossom blight, Botrytis grey mould	General Comments: Apply fungicides for botrytis blight when wet weather occurs. Repeat at 7–10-day intervals through bloom if wet weather continues.					
	M	Ferbam 76 WDG	3.75 kg/1,000 L water	12 hours	40 days	Do not use later than mid-bloom.
		Maestro 80 DF or Supra Captan 80 WDG	2.25 kg/ha	72 hours	2 days	Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Exirel or Timorex Gold.
	3+9	Inspire Super	1.0–1.5 L/ha	12 hours	1 day	Use no more than 2 consecutive applications before rotating to a different fungicide group.
	7	Cantus WDG	560 g/ha	12 hours	0 days	Suppression only (Sercadis). Use once and then rotate to a different fungicide group.
		Kenja 400 SC	0.987–1.24 L/ha	12 hours	7 days	
		Sercadis	250–660 mL/ha	12 hours	0 days	
	7+9	Luna Tranquility	1.2 L/ha	12 hours	0 days	Use once and then rotate to a different fungicide group. Will also control powdery mildew.
	7+11	Pristine WG	1.3–1.6 kg/ha	when dry ¹ / 24 hours ³	0 days	Use once and then rotate to a different fungicide group. Do not tank-mix or make sequential applications with Exirel.
	9	Scala SC	2 L/ha	12 hours	0 days	No product specific comments.
	9+12	Switch 62.5 WG	775–975 g/ha	12 hours	1 day	No product specific comments.
	17	Elevate 50 WDG	1.7 kg/ha	4 hours	1 day	No product specific comments.
	44	Serenade OPTI *	1.7–3.3 kg/ha	when dry	0 days	Suppression only. For best results, use multiple applications or rotate with other products.
	46	Timorex Gold *	1.5–2.0 L/ha	4 hours	2 days	Apply in a high-volume spray to ensure thorough coverage. Do not tank-mix or alternate with Supra Captan, Maestro or sulphur products. See label for precautions on compatibility.

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Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
First bloom						
DO NOT APPLY INSECTICIDES WHILE BLUEBERRIES ARE IN BLOOM. SEE BEE POISONING, PAGE 5.						
Botrytis twig and blossom blight, Botrytis grey mould (cont'd)	NC	Botector *	1 kg in 500–2,000 L water/ha	4 hours	0 days	Suppression only. Not compatible with certain fungicides including Switch. See www.bio-ferm.com for product compatibilities. For products that are not compatible, keep a 3-day interval before and after application. Reapply as needed on a 7–10-day interval up to harvest. Avoid application when heavy rain is forecast. This is a new product in Ontario and little evidence of its efficacy is available.
	P5	Regalia Maxx *	0.25% v/v in 400–800 L water/ha	when dry	0 days	Suppression only. For best results, use multiple applications or rotate with other products. Will also suppress alternaria fruit rot.
Petal fall						
Cherry fruitworm, Cranberry fruitworm	General Comments: • Moths lay eggs on developing crop and larvae tunnel into fruit upon hatching. Use pheromone traps to monitor moth activity and to time the spray accurately. • If traps are not used, spray at petal fall and again in 7–14 days. • Apply in a high-volume spray to ensure thorough coverage. • If bloom or bee hives are still present, choose a product with low bee toxicity, such as Dipel, Bioprotec, Altacor or Intrepid for the petal fall spray. Refer to label for bee toxicity statements.					
	1	Malathion 85 E	1 L/ha	48 hours	1 day	Apply at peak trap capture. Reapply at 4–5-day intervals. If cranberry fruitworm is not a problem, use 550 mL/ha for cherry fruitworm.
		Sevin XLR	4 L/ha	5 days ¹ / 9 days ^{2,3}	2 days	Cranberry fruitworm only. Apply at peak trap capture. Reapply 7 days later if trap catches remain elevated.
	4A	Assail 70 WP	160 g/ha	12 hours ¹ / 48 hours ²	7 days	Active on eggs and young larvae. Apply when trap captures are increasing or at peak trap capture. Reapply in 10–14 days if trap catches rise again. Maximum 2 applications of products from Group 4A per season.
	11	Bioprotec CAF * or Dipel 2X DF *	1.4–2.8 L/ha 1.68 kg/ha	12 hours	0 days	Active on young larvae as they emerge from eggs and feed on treated tissue. Spray at first upswing in trap captures and continue at 3–7-day intervals. Death of insect may take several days. Acidify spray mix to below pH 7.0 and apply on cloudy days or in the evening.
	15	Rimon 10 EC	1.35–2.0 L/ha	12 hours	8 days	Active on eggs and young larvae. Spray at first upswing in trap captures and reapply in 10–14 days. May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds. Avoid spraying if bees are visiting the treatment area.
	18	Confirm 240 F	1.2 L/ha	12 hours	14 days	Cranberry fruitworm only. Active on eggs and young larvae. Spray at first upswing in trap captures and reapply in 10–14 days.
		Intrepid	0.5 L/ha	12 hours	7 days	
	28	Altacor	215–285 g/ha	12 hours	1 day	Spray at first upswing in trap catch and reapply in 7–10 days. Do not tank-mix or make sequential applications of Exirel with Group 11 fungicides, copper fungicides, Supra Captan, Maestro, Bravo or Echo. See product label for numerous other tank-mix restrictions.
		Exirel	0.5–1.0 L/ha	12 hours	3 days	

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Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Petal fall						
White-marked tussock moth	General Comments: - White-marked tussock moth is a sporadic pest. Larvae devour foliage. - A second generation may require control in late summer.					
	11	Bioprotec CAF * or Foray 48 BA	4 L/ha	12 hours	0 days	Product must be consumed to be effective. Spray when and where pests are actively feeding. Make 2 applications 2–5 days apart, when larvae are very small, usually just after Bloom . Death of insect may take several days. Acidify spray mix to below pH 7.0 and apply on cloudy days or in the evening.
European chafer (larvae), Japanese beetle (larvae)	4A	Admire 240 Flowable or Alias 240 SC	1.2 L/ha	24 hours	14 days	Toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements. Do not apply during bloom or when bee hives are present. Apply just prior to egg hatch (shortly after adults are active) to damp soil around bushes and to grass-covered areas around blueberry field. Apply in 200 L water/ha. Move the product into the root zone with 5–10 mm irrigation within 24 hours of application but avoid overwatering. Maximum of 1 application per season, at Petal fall , Green fruit or Postharvest . These products will reduce numbers of white grub larvae but may not provide control.
Anthracnose fruit rot	General Comments: Most fruit infections occur from Bloom to Green fruit. Infected fruit soften near harvest time and orange spore masses develop on the fruit.					
	M	Bravo ZN or Echo 90 DF	7.2 L/ha 4 kg/ha	48 hours	54 days	Will also control alternaria fruit rot. May cause fruit injury if applied to green fruit. Do not use within 10 days of oil. Do not tank-mix or make sequential applications with Exirel.
	3+9	Inspire Super	1.2–1.5 L/ha	12 hours	1 day	Use no more than 2 consecutive applications before rotating to a different fungicide group.
	3+11	Quilt	1 L/ha	12 hours	30 days	Rotate with products from different fungicide groups. Do not tank-mix or make sequential applications with Exirel.
	7+11	Pristine WG	1.3–1.6 kg/ha	when dry ¹ / 24 hours ³	0 days	Do not tank-mix or make sequential applications with Exirel.
	11	Cabrio EG	1.0 kg/ha	12 hours ¹ / 24 hours ³	1 day	Do not tank-mix or make sequential applications with Exirel.
	9+12	Switch 62.5 WG	775–975 g/ha	12 hours	1 day	No product specific comments.
	29	Allegro 500 F	2.24 L/ha	24 hours	30 days	Suppression only.
	33	Aliette	5.6 kg/ha	24 hours	1 day	Apply at 14–21-day intervals.
		Confine Extra	4–5 L/ha	12 hours	1 day	Suppression only.
	NC	Botector *	1 kg in 500– 2,000 L water/ha	4 hours	0 days	See comments on this product for Anthracnose at Green tip .
	P5	Regalia Maxx *	0.25% v/v in 400– 800 L water/ha	when dry	0 days	Suppression only. For best results, use multiple applications or rotate with other products.

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Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Petal fall						
Phomopsis	M	Bravo ZN or Echo 90 DF	7.2 L/ha 4 kg/ha	48 hours	54 days	Will also control alternaria fruit rot. May cause fruit injury if applied to green fruit. Do not use within 10 days of oil. Do not tank-mix or make sequential applications with Exirel.
	7+11	Pristine WG	1.6 kg/ha	when dry ¹ / 24 hours ³	0 days	Do not tank-mix or make sequential applications with Exirel.
	11	Cabrio EG	1 kg/ha	12 hours ¹ / 24 hours ³	1 day	Do not tank-mix or make sequential applications with Exirel.
	29	Allegro 500 F	2.24 L/ha	24 hours	30 days	Suppression only.
	33	Aliette	5.6 kg/ha	24 hours	1 day	Suppression only. Apply at 14–21-day intervals.
Green fruit						
Blueberry aphids	General Comments: - Aphids are rarely a problem on blueberries at this time. - Monitor suckers and new shoots. Apply when population starts to build, but before winged aphids are seen. - Some of these products are highly toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Apply postbloom after bees have been removed. Refer to label for specific bee toxicity statements.					
	3	Pyganic EC 1.4 II *	2.32–4.65 L/ha	12 hours	—	For best results, use high rate, adjust spray solution to pH of 5.5–7.0, and apply promptly after mixing. If possible, apply in the early morning or evening hours. Do not use when bees or other beneficial insects are present.
	3+4A	Concept	560 mL/ha	12 hours	14 days	Do not apply following a soil application of Admire or Alias for white grubs. Maximum 2 applications of products from Group 4A per season.
	4A	Assail 70 WP	56–86 g/ha	12 hours ¹ / 48 hours ²	7 days	Do not apply following a soil application of Admire or Alias for white grubs. Maximum 2 applications of products from Group 4A per season.
		Admire 240 Flowable	175 mL/ha	24 hours	3 days	
	4D	Sivanto Prime	500–750 mL/ha	12 hours	3 days	Toxic to certain beneficial insects. Where possible, rotate with products outside of Group 4.
	23	Movento 240 SC	220–365 mL/ha	12 hours	7 days	No product specific comments.
	28	Exirel	0.75–1.5 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Supra Captan, Maestro, Bravo or Echo. See product label for numerous other tank-mix restrictions.
	NC	Vegol Crop Oil *	2% v/v in 700– 1,900 L water/ha	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all cultivars. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Supra Captan or Maestro fungicides and 30 days of sulphur. Do not apply to wet foliage.

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Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Green fruit						
Obliquebanded leafroller	General Comments: • Apply when eggs are hatching and young larvae are present. • Place pheromone traps in crop by early June. Apply insecticides for summer-generation larvae at 240–280 DDC (base 6.1°C) after first sustained moth catch. See Appendix B: <i>Degree-Day Modeling</i>, page 428. • Many of these products are also labelled for spanworms (known as inchworms or loopers) and other caterpillars. See label for a complete list of registered uses.					
	5	Delegate	100–200 g/ha	12 hours	3 days	Reapply as necessary on a 7–10-day schedule. Toxic to bees exposed to direct treatment, drift or residues on blooming plants.
		Entrust * or Success	267–364 mL/ha 145–182 mL/ha	when dry	3 days	
	11	Bioprotec CAF * or Dipel 2X DF *	1.4–2.8 L/ha 525–1,125 g/ha	12 hours	0 days	Product must be consumed to be effective. Spray when and where pests are actively feeding. Make 2 applications 5–7 days apart, when larvae are very small. Death of insect may take several days. Acidify spray mix to below pH 7.0 and apply on cloudy days or in the evening.
	18	Confirm 240 F	1.0 L/ha	12 hours	14 days	Active on eggs and young larvae.
		Intrepid	0.5 L/ha	12 hours	7 days	
	28	Altacor	285 g/ha	12 hours	1 day	Do not tank-mix or make sequential applications of Exirel with Group 11 fungicides, copper fungicides, Supra Captan, Maestro, Bravo or Echo. See product label for numerous other tank-mix restrictions.
		Exirel	0.5–1.0 L/ha	12 hours	3 days	
Plum curculio	General Comments: • Scout field edges for crescent-shaped scars on green blueberry fruit. Apply insecticide at the first sign of injury.					
	28	Exirel	1.0–1.5 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Captan, Maestro, Bravo or Echo. See product label for numerous other tank-mix restrictions.
Japanese beetle adults	General Comments: • Apply at the first sign of adult activity. Check product label and Table 3–1. <i>Products Used on Blueberries</i>, page 107, for preharvest intervals.					
	1	Imidan WP	1.6 kg/1,000 L water	3 days ^{1,4} / 15 days ⁵	15 days	No product specific comments.
	4A	Admire 240 Flowable	175–230 mL/ha	24 hours	3 days	Apply postbloom after bees have been removed. Do not make a foliar application following a soil application of a Group 4A insecticide. Maximum 2 applications of products from Group 4A per season.
	28	Altacor	285 g/ha	12 hours	1 day	Suppression only.
		Exirel	1.5 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Supra Captan, Maestro, Bravo or Echo. See product label for numerous other tank-mix restrictions.

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Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Green fruit						
European chafer (larvae), Japanese beetle (larvae)	Spray once, as a high-volume spray on the soil at Petal fall, Green fruit or Postharvest , using one of the products listed for European chafer (larvae) and Japanese beetle (larvae) at Petal fall .					
Fruit ripening						
Spotted wing drosophila	General Comments: - Spotted wing drosophila inserts eggs into ripening fruit. Larvae develop in the fruit and may be present at harvest, contributing to premature breakdown. - Weekly insecticides are recommended when fruit is ripening or ripe and flies are present. Rotate between products from different groups. - Frequent picking, burial of grade-out fruit and general sanitation are very important to prevent problems. - These products rely on contact in order to control spotted wing drosophila adults. Apply in a high-volume spray to ensure thorough coverage of fruit. - These products are toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements. - Emergency use registration of other products is expected. Check ontario.ca/spottedwing for updates on pest development, registered products and management strategies.					
	1	Imidan WP	1.6 kg/1,000 L water	3 days ^{1,4} / 15 days ⁵	15 days	Note the 15 days to harvest interval.
	5	Delegate	315–420 g/ha	12 hours	3 days	Use high rate and shorten interval between applications under high pest pressure.
		Entrust * or Success	334–440 mL/ha 165–220 mL/ha	when dry	3 days	
	28	Exirel	1.0–1.5 L/ha	12 hours	3 days	Use high rate and shorten interval between applications under high pest pressure. Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Supra Captan, Maestro, Bravo or Echo. See product label for numerous other tank-mix restrictions.
Blueberry maggot	General Comments: - Blueberry maggot is regulated in southern Ontario by the Canadian Food Inspection Agency (CFIA). To prevent spread of blueberry maggot, fresh blueberries moving out of the regulated area require a movement certificate issued by the CFIA. See D-02-04: <i>The Blueberry Certification Program and domestic phytosanitary requirements</i> on the CFIA website for details and the boundaries of the regulated area. - Monitor using yellow sticky traps and apply when first flies are trapped or when berries begin to turn blue, about July 5–15 depending on the area and season. Reapply 5–12 days later, depending on the product. Protection is needed as long as adults are active. - Some of these products are toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements.					
	1A	Sevin XLR	4 L/ha	5 days ¹ / 9 days ^{2,3}	2 days	Residual activity is 5–7 days.
	1B	Cygon 480-AG or Lagon 480 E	830 mL/ha	12 hours ¹ / 12 days ³	21 days	Do not use on crops destined for U.S. markets. Residual activity is 10–12 days.
		Imidan WP	1.6 kg/ha	3 days ^{1,4} / 15 days ⁵	15 days	Residual activity is 10–12 days.
		Malathion 85 E	550 mL/ha	48 hours	1 day	Residual activity is 5–7 days.

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Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Fruit ripening						
Blueberry maggot (cont'd)	4A	Admire 240 Flowable	230–350 mL/ha	24 hours	3 days	Do not make a foliar application following a soil application of a Group 4A insecticide. Maximum 2 applications of products from Group 4A per season.
		Assail 70 WP	136–160 g/ha	12 hours ¹ / 48 hours ²	7 days	
	4D	Sivanto Prime	0.75–1.0 L/ha	12 hours	3 days	Toxic to certain beneficial insects. Where possible, rotate with products outside of Group 4.
	5	GF-120 Fruit Fly Bait *	1.5 L/ha	12 hours	—	Begin applications when first flies are trapped or 2–3 weeks before fruit begins to ripen. Reapply every 7 days, or sooner if rain or overhead irrigation washes off residue. Large droplet sizes optimize the attractiveness of the bait. Proper application techniques help ensure adequate coverage. Apply using an all-terrain vehicle fitted with an appropriate sprayer and nozzle for a large spray droplet size of 4–6 mm directed to underside of leaves and inside the canopy.
	23	Movento 240 SC	365–435 mL/ha	12 hours	7 days	No product specific comments.
	28	Exirel	1.0–1.5 L/ha	12 hours	3 days	Suppression only. Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Supra Captan, Maestro, Bravo or Echo. See product label for numerous other tank-mix restrictions.
White-marked tussock moth	General Comments: White-marked tussock moth is a sporadic pest. Larvae devour foliage.					
	11	Bioprotec CAF * or Foray 48 BA	4 L/ha	12 hours	0 days	Product must be consumed to be effective. Spray when and where pests are actively feeding. Make 2 applications 2–5 days apart, when larvae are very small, usually just after Bloom . Death of insect may take several days. Acidify spray mix to below pH 7.0 and apply on cloudy days or in the evening.
Botrytis grey mould	General Comments: Spray at 7–10-day intervals if botrytis grey mould was not well controlled during Bloom.					
	M	Maestro 80 DF or Supra Captan 80 WDG	2.25 kg/ha	72 hours	2 days	Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Exirel or Timorex Gold.
	3+9	Inspire Super	1.0–1.5 L/ha	12 hours	1 day	Use no more than 2 consecutive applications before rotating with a different fungicide group.
	7	Cantus WDG	560 g/ha	12 hours	0 days	Suppression only (Sercadis). Use once, then rotate to a different fungicide group.
		Kenja 400 SC	0.987–1.24 L/ha	12 hours	7 days	
		Sercadis	250–666 mL/ha	12 hours	0 days	
	7+9	Luna Tranquility	1.2 L/ha	12 hours	0 days	Apply prior to harvest to improve postharvest disease control. Use once, then rotate to a different fungicide group. Will also control powdery mildew.

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Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Fruit ripening						
Botrytis grey mould (cont'd)	9	Scala SC	2 L/ha	12 hours	0 days	No product specific comments.
	9+12	Switch 62.5 WG	775–975 g/ha	12 hours	1 day	No product specific comments.
	17	Elevate 50 WDG	1.7 kg/ha	4 hours	1 day	No product specific comments.
	44	Serenade OPTI *	1.7–3.3 kg/ha	when dry	0 days	Suppression only. For best results, use multiple applications or rotate with other products.
	46	Timorex Gold *	1.5–2.0 L/ha	4 hours	2 days	Apply in a high-volume spray to ensure thorough coverage. Do not tank-mix or alternate with Supra Captan, Maestro or sulphur products. See label for precautions on compatibility.
	NC	Botector *	1 kg in 500–2,000 L water/ha	4 hours	0 days	See comments on this product for Botrytis at First bloom .
	P5	Regalia Maxx *	0.25% v/v in 400–800 L water/ha	when dry	0 days	Suppression only. For best results, use multiple applications or rotate with other products.
Anthracnose fruit rot	General Comments: Most infections take place during bloom. Fungicides at this time are not necessary if good control was achieved earlier.					
	3	Quash	180 g/ha	12 hours ¹ / 72 hours ²	7 days	No product specific comments.
	3+9	Inspire Super	1.2–1.5 L/ha	12 hours	1 day	Use no more than 2 consecutive applications before rotating to a different fungicide group.
	9+12	Switch 62.5 WG	775–975 g/ha	12 hours	1 day	No product specific comments.
	7+11	Pristine WG	1.3–1.6 kg/ha	when dry ¹ / 24 hours ³	0 days	Do not tank-mix or make sequential applications with Exirel.
	11	Cabrio EG	1 kg/ha	12 hours ¹ / 24 hours ³	1 day	Do not tank-mix or make sequential applications with Exirel.
	P5	Regalia Maxx *	0.25% v/v in 400–800 L water/ha	when dry	0 days	Suppression only. For best results, use multiple applications at 7–10 day intervals or rotate with other products.
	NC	Botector *	1 kg in 500–2,000 L water/ha	4 hours	0 days	See comments on this product for Anthracnose at Green tip .

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Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Postharvest						
Leafhoppers	General Comments: - The sharp-nosed leafhopper is a vector of the blueberry stunt phytoplasma, a virus-like organism that causes blueberry stunt disease. Postharvest leafhopper control is important if blueberry stunt is a problem. - These products are toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements.					
	3	Pyganic EC 1.4 II *	2.32–4.65 L/ha	12 hours	—	Apply when pests are first observed. Do not wait until plants are heavily infested. Reapply if needed. For best results, use high rate, adjust spray solution to pH of 5.5–7.0 and apply promptly after mixing. If possible, apply in the early morning or evening hours. Do not use when bees or other beneficial insects are present.
	4A	Admire 240 Flowable	175 mL/ha	24 hours	3 days	Do not make a foliar application following a soil application of a Group 4A insecticide. Maximum 2 applications of products from Group 4A per season.
Phytophthora root rot	33	Phostrol	2.9–5.8 L/ha	12 hours	0 days	Suppression only. May cause crop injury in the form of marginal leaf necrosis and brown spots. Apply in a high-volume spray to reduce the risk of crop injury.
European chafer (larvae), Japanese beetle (larvae)	Spray once, as a high-volume spray on the soil at Petal fall, Green fruit or Postharvest , using one of the products listed for European chafer (larvae), Japanese beetle (larvae) at Petal fall .					
Special sprays						
These pests are not common in Ontario. Spray if and when monitoring indicates the need.						
Lecanium scale	General Comments: If lecanium scale is a problem, use one of the products listed for Scale at Dormant (late winter) and follow up with Movento when crawlers are present, as indicated on black sticky tape.					
	23	Movento 240 SC	365–585 mL/ha	12 hours	7 days	Use postbloom only. Toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements.
Tipworm	23	Movento 240 SC	365–435 mL/ha	12 hours	7 days	Use postbloom only. Toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements.
Gall midge	General Comments: - Blueberry gall midge feed in buds and cause new leaves in shoot tips to be distorted, dried up or blackened. - These products are toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements.					
	23	Movento 240 SC	365–435 mL/ha	12 hours	7 days	Use postbloom only.
	28	Exirel	0.75–1.0 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Supra Captan, Maestro, Bravo or Echo. See product label for numerous other tank-mix restrictions.

¹ General re-entry. ² Hand pruning. ³ Hand harvest. ⁴ Personal protective equipment required for certain activities. See label. ⁵ Pick your own harvest.

— = Information not applicable or not specified on product label. * Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Special sprays These pests are not common in Ontario. Spray if and when monitoring indicates the need.						
Brown marmorated stink bug	General Comments: At time of printing this publication, this pest has not been detected in blueberries, but breeding populations are present in Ontario. Check ontario.ca/stinkbug for updates on pest development, registered products and management strategies.					
	4A	Actara 25 WG	280 g/ha	12 hours	3 days	Suppression only. Maximum 2 applications of products from Group 4A per season. This product is toxic to beneficial insects and should be used only when necessary.
Blueberry bud mite	General Comments: This pest has not been detected in Ontario, but is present in Michigan.					
	23	Envirdor 240 SC	1.3 L/ha	12 hours	7 days	No product specific comments.
Alternaria leaf spot	3+9	Inspire Super	0.836 –1.5 L/ha	12 hours	1 day	Apply at Green tip , Pink bud and Petal fall if the weather is cool and wet and there is a history of disease.
Septoria leaf spot	3	Proline 480 SC	315 mL/ha	24 hours	7 days	Suppression only.
	7	Sercadis	250–666 mL/ha	12 hours	0 days	No product specific comments.
	33	Phostrol	2.9–5.8 L/ha	12 hours	0 days	Use the higher rate and shorten interval between applications under high disease pressure. May cause crop injury in the form of marginal leaf necrosis and brown spots. Apply in a high-volume spray to reduce the risk of crop injury.
Leaf rust	3	Proline 480 SC	400 mL/ha	24 hours	7 days	Suppression only.
	3+9	Inspire Super	836 mL/ha	12 hours	1 day	Suppression only.
Valdensinia leaf spot	3	Proline 480 SC	400 mL/ha	24 hours	7 days	Suppression only.

¹ General re-entry. ² Hand pruning. ³ Hand harvest. ⁴ Personal protective equipment required for certain activities. See label. ⁵ Pick your own harvest.
 — = Information not applicable or not specified on product label. * Potentially organic. Check with certifying body.

Blueberry maggot is a regulated pest. New infestations must be reported to the Canadian Food Inspection Agency (CFIA).

Blueberry maggot can spread to new areas in soil, harvest containers, or when infested fruit is purchased from another region and disposed of on your farm.

Use best management practices to prevent spread of blueberry maggot to new areas.

See ontario.ca/crops and document D-02-04 on the CFIA website (www.inspection.gc.ca).

Table 3–1. Products Used on Blueberries

Use this table as a guide but refer to product label for specific information.

The **preharvest interval** is the number of days between the last spray and first harvest.

The **restricted entry interval** is the minimum interval that must be observed between application of the pesticide and work in the treated crop without protective equipment. If no re-entry period is stated on the label, assume it is 12 hours.

The **maximum applications** is the labelled maximum number or product amount applied for the growing season and may be higher than what is recommended for resistance management or for the preservation of beneficial insects and mites.

Products listed as **potentially organic** may be acceptable for organic use based on *Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec publication Bulletin D'Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with certifying body to verify the acceptability of any product prior to using it.

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
Products used for insect and mite control or suppression							
Actara 25 WG	28408	thiamethoxam	4A	3 days	12 hours	2	—
Admire 240 Flowable	24094	imidacloprid	4A	3 days ¹ /14 days ²	24 hours	1 ² /2 ¹	—
Alias 240 SC	28475	imidacloprid	4A	14 days	24 hours	1	—
Altacor	28981	chlorantraniliprole	28	1 day	12 hours	3 (max. 645 g/ha)	—
Assail 70 WP	27128	acetamiprid	4A	7 days	12 hours ³ /48 hours ⁴	4	—
Bioprotec CAF	26854	<i>Bacillus thuringiensis</i>	11	0 days	12 hours	4	✓
Concept	29611	imidacloprid + deltamethrin	3+4A	14 days	12 hours	3	—
Confirm 240 F	24503	tebufenozide	18	14 days	12 hours	4 (max 4.6 L/ha)	—
Cygon 480-AG	25651	dimethoate	1B	21 days	12 hours ³ /12 days ⁵	2	—
Decis 5 EC	22478	deltamethrin	3	14 days	12 hours	—	—
Delegate	28778	spinetoram	5	3 days	12 hours	3	—
Dipel 2X DF	26508	<i>Bacillus thuringiensis</i>	11	0 days	12 hours	4	✓
Entrust	30382	spinosad	5	3 days	when dry	3	✓
Envior 240 SC	28051	spirodiclofen	23	7 days	12 hours	1	—
Exirel	30895	cyantraniliprole	28	3 days	12 hours	4 (max. 4.5 L/ha)	—
Foray 48 BA	24978	<i>Bacillus thuringiensis</i>	11	—	12 hours	—	—
GF-120 Fruit Fly Bait	28336	spinosad	5	—	12 hours	5	✓
Imidan WP	29064	phosmet	1B	15 days	3 days ^{3,6} /15 days ⁷	2	—
Intrepid	27786	methoxyfenozide	18	7 days	12 hours	4 (max. 2 L/ha)	—

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Plant extract.

— = Information is not specified on the product label. ✓ = Potentially organic. Check with certifying body.

¹ Foliar application. ² Soil application. ³ General re-entry. ⁴ Hand pruning. ⁵ Hand harvest. ⁶ Personal protective equipment required for certain activities. See label. ⁷ Pick your own harvest.

⁸ Maximum 6 applications per year with no more than 2 dormant applications. ⁹ Maximum 2 applications per year for botrytis or 4 (max. 5.9 L/ha) applications per year for mummy berry, leaf spot, alternaria leaf spot, anthracnose and rust.

Table 3–1. Products Used on Blueberries (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
Products used for insect and mite control or suppression							
Lagon 480 E	9382	dimethoate	1B	21 days	12 hours ³ /12 days ⁵	2	—
Malathion 85 E	8372	malathion	1B	1 day	48 hours	3	—
Movento 240 SC	28953	spirotetramat	23	7 days	12 hours	max. 1.8 L/ha	—
Purespray Green Spray Oil 13 E	27666	mineral oil	NC	dormant	12 hours	1	✓
Pyganic EC 1.4 II	30164	pyrethrins	3	—	12 hours	8	✓
Rimon 10 EC	28881	novaluron	15	8 days	12 hours	3	—
Sevin XLR	27876	carbaryl	1A	2 days	5 days ³ /9 days ^{4,5}	—	—
Sivanto Prime	31452	flupyradifurone	4D	3 days	12 hours	max. 2 L/ha	—
Success	26835	spinosad	5	3 days	when dry	3	—
Superior 70 Oil	9542, 14981	mineral oil	NC	dormant	12 hours	1	✓
Vegol Crop Oil	32408	canola oil	NC	0 days	12 hours	2/4 ⁸	✓
Products used for disease control or suppression							
Actinovate SP	28672	<i>Streptomyces lydicus</i>	NC	—	1 hour	—	✓
Aliette	27688	fosetyl al	33	1 day	24 hours	4	—
Allegro 500 F	27517	fluazinam	29	30 days	24 hours	4	—
Botector	31248	<i>Aureobasidium pullulans</i>	NC	0 days	4 hours	6	✓
Bravo ZN	28900	chlorothalonil	M	54 days	48 hours	3	—
Bumper 432 EC	28017	propiconazole	3	60 days	12 hours ³ /5 days ⁴	2	—
Cabrio EG	27323	pyraclostrobin	11	1 day	12 hours ³ /24 hours ⁵	4	—
Cantus WDG	30141	boscalid	7	0 days	12 hours	4	—
Supra Captan 80 WDG	24613	captan	M	2 days	72 hours	—	—
Confine Extra	30648	mono- and di-potassium salts of phosphorous acid	33	1 day	12 hours	5	—
Echo 90 DF	29356	chlorothalonil	M	54 days	48 hours	3	—
Elevate 50 WDG	25900	fenhexamid	17	1 day	4 hours	4	—
Ferbam 76 WDG	20136	ferbam	M	40 days	12 hours	—	—

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Plant extract.

— = Information is not specified on the product label. ✓ = Potentially organic. Check with certifying body.

¹ Foliar application. ² Soil application. ³ General re-entry. ⁴ Hand pruning. ⁵ Hand harvest. ⁶ Personal protective equipment required for certain activities. See label. ⁷ Pick your own harvest.

⁸ Maximum 6 applications per year with no more than 2 dormant applications. ⁹ Maximum 2 applications per year for botrytis or 4 (max. 5.9 L/ha) applications per year for mummy berry, leaf spot, alternaria leaf spot, anthracnose and rust.

Table 3–1. Products Used on Blueberries (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
Products used for disease control or suppression							
Fitness	32639	propiconazole	3	60 days	12 hours ³ /5 days ⁴	2	—
Funginex DC	27686	triforine	3	60 days	48 hours	3	—
Indar	27294	fenbuconazole	3	30 days	12 hours	4	—
Inspire Super	30827	difenoconazole + cyprodinil	3+9	1 day	12 hours	2/4 ⁹	—
Jade	24030	propiconazole	3	60 days	12 hours ³ /5 days ⁴	2	—
Kenja 400 SC	31758	isofetamid	7	7 days	12 hours	3	—
Lime Sulphur	16465	calcium polysulphide	M	dormant	48 hours	1	✓
Luna Tranquility	30510	fluopyram + pyrimethanil	7+9	0 days	12 hours	2	—
Maestro 80 DF	26408	captan	M	2 days	72 hours	—	—
Phostrol	30449	mono- and dibasic sodium, potassium and ammonium phosphites	33	0 days	12 hours	4	—
Pristine WG	27985	boscalid + pyraclostrobin	7+11	0 days	when dry ³ /24 hours ⁵	4	—
Proline 480 SC	28359	prothioconazole	3	7 days	24 hours	2	—
Quash	30402	metconazole	3	7 days	12 hours ³ /72 hours ⁴	3	—
Quilt	28328	propiconazole + azoxystrobin	3+11	30 days	12 hours	4	—
Regalia Maxx	30199	extract of <i>Reynoutria sachalinensis</i>	P5	0 days	when dry	—	✓
Ridomil Gold 480 SL	28474	metalaxyl-M and S	4	80 days	12 hours	1	—
Scala SC	28011	pyrimethanil	9	0 days	12 hours	2	—
Sercadis	31697	fluxapyroxad	7	0 days	12 hours	3	—
Serenade OPTI	31666	<i>Bacillus subtilis</i>	44	0 days	when dry	—	✓
Switch 62.5 WG	28189	cyprodinil + fludioxonil	9+12	1 day	12 hours	3	—
Tilt 250 E	19346	propiconazole	3	60 days	12 hours ³ /5 days ^{4,5}	2	—
Timorex Gold	30910	tea tree oil	46	2 days	4 hours	—	✓

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Plant extract.

— = Information is not specified on the product label. ✓ = Potentially organic. Check with certifying body.

¹ Foliar application. ² Soil application. ³ General re-entry. ⁴ Hand pruning. ⁵ Hand harvest. ⁶ Personal protective equipment required for certain activities. See label. ⁷ Pick your own harvest.

⁸ Maximum 6 applications per year with no more than 2 dormant applications. ⁹ Maximum 2 applications per year for botrytis or 4 (max. 5.9 L/ha) applications per year for mummy berry, leaf spot, alternaria leaf spot, anthracnose and rust.

Notes on Blueberry Diseases and Insects

In this section:

Table 3–2. *Activity of Fungicides on Blueberry Diseases and Impact on Honeybees*, on this page.

Table 3–3. *Activity of Insecticides on Blueberry Pests and Impact on Honeybees*, page 112.

Table 3–2. Activity of Fungicides on Blueberry Diseases and Impact on Honeybees

Use fungicides only for the disease listed on the product label for the crop. The information provided in this table is intended to assist the grower in choosing the best fungicide for control of pests listed on the product label, while managing resistance and avoiding unnecessary sprays for non-target pests. Efficacy can be affected by rate of the product.

Group	Product	Mummy berry (shoot blight)	Phomopsis stem canker	Anthracnose fruit rot	Botrytis fruit rot	Alternaria fruit rot	Phytophthora root rot	Honeybee Toxicity ¹
M	Bravo ZN	1	2 *	2 *	1	1 *	0	NT
M	Echo 90 DF	1	2 *	2 *	1	1 *	0	NT
M	Ferbam 76 WDG	1	—	—	1 *	1	0	NT
M	Lime Sulphur	1	1	1	—	—	0	NT
M	Maestro 80 DF	1 *	1	2	1–2 *	1	0	MT
M	Supra Captan 80 WDG	1 *	1	2	1–2 *	1	0	MT
3	Bumper 432 EC	3 *	1	2	0	0	0	NT
3	Fitness	3 *	1	2	0	0	0	NT
3	Funginex DC	3 *	2	0	0	0	0	NT
3	Indar	3 *	2	0	—	—	0	NT
3	Jade	3 *	1	2	0	0	0	NT
3	Proline 480 SC	3 *	2	2	—	—	0	NT
3	Quash	3 *	2 *	2 *	0	0	0	NT
3	Tilt 250 E	3 *	1	2	0	0	0	NT

M = Multi-site fungicides. NC = Not classified by FRAC, or group not indicated on product label. P = Plant extract.

0 = No control. 1 = Poor to fair control. 2 = Good control, some limitations. 3 = Excellent control, few if any limitations. * (shaded area) = Disease is listed on the product label for control or suppression. — = No information is available.

Adopted from several sources including *Michigan State Fruit Management Guide 2011*.

MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.

NT = Relatively non-toxic to bees.

¹ Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

Table 3–2. Activity of Fungicides on Blueberry Diseases and Impact on Honeybees (cont'd)

Group	Product	Mummy berry (shoot blight)	Phomopsis stem canker	Anthraco­nose fruit rot	Botrytis fruit rot	Alternaria fruit rot	Phytophthora root rot	Honeybee Toxicity ¹
3+9	Inspire Super	3 *	2	— *	3 *	— *	0	NT
3+11	Quilt	3 *	—	3 *	—	—	0	NT
4	Ridomil Gold 480 SL	0	0	0	0	0	3 *	NT
7	Cantus WDG	0	—	—	3 *	2	0	NT
7	Kenja 400 SC	—	—	—	— *	—	—	NT
7	Sercadis	—	—	—	1 *	1	0	NT
7+9	Luna Tranquility	—	—	2	3 *	2	0	NT
7+11	Pristine WG	1–2	3 *	3 *	3 *	2	0	NT
9	Scala SC	—	—	1	3 *	—	0	NT
9+12	Switch 62.5 WG	1	1	3 *	3 *	3	0	NT
11	Cabrio EG	1	3 *	3 *	1	1	0	NT
17	Elevate 50 WDG	0	0	0	3 *	0	0	NT
29	Allegro 500 F	1 *	1 *	1–2 *	—	1	0	NT
33	Aliette	0	2 *	2 *	—	2	2 *	NT
33	Confine Extra	0	2	1 *	—	2	2	NT
33	Phostrol	1	1	1	—	1	1 *	NT
44	Serenade OPTI	2 *	1	0	1 *	—	0	NT
46	Timorex Gold	—	—	—	2 *	—	—	NT
NC	Actinovate SP	0–1 *	—	—	1	—	0	NT
NC	Botector	—	—	— *	— *	—	—	NT
P5	Regalia Maxx *	1 *	—	1 *	1 *	1 *	—	NT

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0 = No control. 1 = Poor to fair control. 2 = Good control, some limitations. 3 = Excellent control, few if any limitations. * (shaded area) = Disease is listed on the product label for control or suppression. — = No information is available.

Adopted from several sources including *Michigan State Fruit Management Guide 2011*.

MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.

NT = Relatively non-toxic to bees.

¹ Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

Table 3–3. Activity of Insecticides on Blueberry Pests and Impact on Honeybees

Use products only for pests listed on the product label for the crop. The information provided in this table is based on information from other areas. It is intended to assist the grower in choosing the best insecticide for control of pests listed on the product label, while managing resistance and avoiding unnecessary sprays for non-target pests. Efficacy can be affected by rate of the product.

Group	Insecticide	Aphid	Blueberry maggot	Cranberry fruitworm, Cherry fruitworm	Japanese beetle (adult)	Leafroller	Plum curculio	Scale insects	Spotted wing drosophila (adult)	White grubs (larva)	Honeybee Toxicity ¹
1A	Sevin XLR	—	2 *	2 *	3	1 *	2	1 *	1	0	HT
1B	Cygon 480-AG	2	3 *	3	—	—	1	—	3	0	HT
1B	Imidan WP	—	3 *	3	3 *	3	3	—	3 * +	0	HT
1B	Lagon 480 E	2	3 *	3	—	—	1	—	3	0	HT
1B	Malathion 85 E	1 *	2 *	2 *	1	1 *	2	—	3	0	HT
3	Decis 5 EC	—	2	—	—	2	1	—	3	0	HT
3	Pyganic EC 1.4 II	1 *	0	—	—	—	—	0	1	0	HT
3+4A	Concept	3 *	2	2	—	—	—	—	2	0	HT
4A	Actara 25 WG	3	2	—	2	—	3	—	0	2	HT
4A	Admire 240 Flowable	3 *	2 *	0	2 *	—	—	—	0	2 *	HT
4A	Alias 240 SC	3 *	2 *	0	2 *	—	—	—	0	2 *	HT
4A	Assail 70 WP	3 *	3 *	2 *	2	—	2	—	1	0	MT
4D	Sivanto Prime	3 *	2–3 *	—	—	—	—	—	—	—	MT
5	Delegate	0	2	3	0	3 *	2	0	3 *	0	HT
5	Entrust	0	2	3	0	3 *	1	0	2–3 *	0	HT
5	GF-120 Fruit Fly Bait	0	2 *	0	0	0	0	0	—	0	HT

NC = Not classified by IRAC, or group not indicated on product label.

0 = No control. 1 = Poor to fair control. 2 = Good control. 3 = Excellent control.

* (shaded area) = Pest is listed on the product label for control or suppression. — = No information is available. + Product efficacy may be reduced due to long preharvest intervals.

Adopted from several sources including *Michigan State Fruit Management Guide 2011*.

HT = Highly toxic to bees. Severe losses may be expected if used when bees are present at treatment time or within a few days thereafter.

MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.

NT = Relatively non-toxic to bees.

¹ Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

² May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

Table 3–3. Activity of Insecticides on Blueberry Pests and Impact on Honeybees (cont'd)

Group	Insecticide	Aphid	Blueberry maggot	Cranberry fruitworm, Cherry fruitworm	Japanese beetle (adult)	Leafroller	Plum curculio	Scale insects	Spotted wing drosophila (adult)	White grubs (larva)	Honeybee Toxicity ¹
5	Success	0	2	3	0	3 *	1	0	3 *	0	HT
11	Bioprotec CAF	0	0	1	0	2 *	0	0	0	0	NT
11	Dipel 2X DF	0	0	1	0	2 *	0	0	0	0	NT
11	Foray 48 BA	0	0	1	0	2 *	0	0	0	0	NT
15	Rimon 10 EC	—	—	3 *	0	3	0	—	1	0	MT ²
18	Confirm	0	0	3 *	0	3 *	0	0	0	0	NT
18	Intrepid	0	0	3 *	0	3 *	0	0	0	0	NT
23	Movento 240 SC	3 *	3 *	—	—	—	—	3 *	1	0	HT ²
28	Altacor	0	—	3 *	1	3 *	0	0	0	0	NT
28	Exirel	3 *	1 *	3 *	3 *	3 *	3 *	—	3 *	0	HT
NC	Purespray Green Spray Oil 13 E	2	0	0	0	0	0	3 *	0	0	—
NC	Superior 70 Oil	2	0	0	0	0	0	3 *	0	0	—
NC	Vegol Crop Oil	2 *	—	—	—	—	—	3 *	—	—	—

NC = Not classified by IRAC, or group not indicated on product label.

0 = No control. 1 = Poor to fair control. 2 = Good control. 3 = Excellent control.

* (shaded area) = Pest is listed on the product label for control or suppression. — = No information is available. + Product efficacy may be reduced due to long preharvest intervals.

Adopted from several sources including *Michigan State Fruit Management Guide 2011*.

HT = Highly toxic to bees. Severe losses may be expected if used when bees are present at treatment time or within a few days thereafter.

MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.

NT = Relatively non-toxic to bees.

¹ Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

² May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

CURRANT AND GOOSEBERRY CALENDAR

In this section:

- Read the product label and follow all safety precautions. 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>.
- Unless specified on the product label, use enough water to ensure thorough spray coverage. Where the product rate is listed in amount per 1,000 L, and if a water volume is not provided on the label, use enough water to wet the foliage to the near-drip point.
- For preharvest interval, restricted entry interval and maximum number of applications, see Table 3–4. *Products Used on Currants and Gooseberries*, page 122.
- **Products are listed by chemical group and in alphabetical order within each group. The order does not reflect efficacy.**
- Where a product in the calendar is followed by a “*”, it is potentially acceptable for organic use based on *Ministère de l’Agriculture, des Pêcheries et de l’Alimentation du Québec publication Bulletin D’Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with your certifying body to verify the acceptability of any product prior to using it.

Resistance Management

To delay development of resistance to fungicides, insecticides and miticides, follow resistance management guidelines outlined in *Resistance Management Strategies*, page 393. The chemical group is indicated in the column before the product name. Products belonging to the same chemical group are grouped together in the calendar. Multi-site (M) fungicides are not prone to resistance and do not have to be rotated. Some products are not classified to mode of action (NC) and the mode of action has not been determined for others (U or UN).

Fungicide resistance management

Take the following steps to avoid rapid development of fungicide resistance:

- Do not reduce rates below those specified on the label.
- Do not use products containing the same chemical group in consecutive applications.
- Use products containing only one chemical family no more than twice per season.
- Use co-formulations or products that must be tank-mixed with another chemical group no more than 3 times per season.
- Use sufficient water to provide thorough coverage.

Insecticide resistance management

Take the following steps to avoid development of insecticide resistance:

- For pests with discrete generations, do not use insecticides from the same group for more than one generation. Within a generation, if more than one spray is required, use a product from the same chemical group.
- For pests with rapidly building and overlapping generations (mites, aphids), do not use products containing the same chemical group in consecutive applications.

Bee Toxicity

Some insecticides are toxic to bees and other pollinating insects. Use of insecticides on flowering crops requires careful management to avoid negative effects on pollinators. Some insecticides cannot be applied prior to or during bloom. For others, use extreme caution when applying insecticides to currants and gooseberries during bloom—do not apply them while bees are active. Before and after bloom, bees may still be present on flowering cover crops and weeds—do not allow drift of insecticides onto these or other flowering crops. Always follow label precautions regarding avoiding impacts on bees. For more information, see *Bee Poisoning*, page 5, and honeybee toxicity ratings in Table 3–4. *Products Used on Currants and Gooseberries*, page 122.

Buffer Zones

Leave a suitable buffer zone between treatment area and adjacent sensitive areas, such as hedgerows, woodlots and freshwater habitats. Zones may vary depending on the product used, growth stage of the crop and method of application including the use of drift-reducing technology. Check the pesticide label for requirements.

Use Health Canada's online spray drift calculator to modify the buffer zone specified on the label based on weather conditions, category of spray equipment and 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. Unfortunately, this model does not account for carrier volume, travel speed or crop stage.

Observing buffer zones is a legal requirement. A record of the buffer zone modification, if any, must be retained for at least one year from the time of application.

Crop Nutrition

Crop nutrition is important for plant growth and fruit quality on berry crops. Soil testing, plant tissue analysis and visual deficiency symptoms all play an important role in assessing and monitoring the crop's nutritional status. For more information, visit <http://www.omafra.gov.on.ca/english/crops/hort/berry.html> (click on *Soil Management, Fertilizer Use, Crop Nutrition and Cover Crops for Fruit Production*) and see OMAFRA Publication 611, *Soil Fertility Handbook*. For soil testing and plant tissue analysis services, see Appendix E: *Accredited Soil-Testing Laboratories in Ontario*, page 435.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Just before blossoms open						
DO NOT APPLY INSECTICIDES WHILE CURRANTS OR GOOSEBERRIES ARE IN BLOOM. SEE BEE POISONING, PAGE 5.						
Aphids	General Comments: • Currant blister aphid feeds on new growth, causing leaf curl and red blisters. Spray if aphids are abundant. • Ensure good coverage of undersides of curled leaves. • Do not apply during bloom of crops or weeds in treatment area.					
	4A	Assail 70 WP	56–86 g/ha	12 hours ¹ / 48 hours ²	7 days	Maximum 2 applications of Group 4A products per season. Toxic to certain beneficial insects. Do not apply when bees are actively foraging.
	4D	Sivanto Prime	500–750 mL/ha	12 hours	3 days	Toxic to certain beneficial insects. Where possible, rotate with products outside of Group 4.
	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	Feeding deterrent only. Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Supra Captan, Maestro or sulphur.
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Supra Captan, Maestro or copper and 30 days of sulphur. Do not apply to wet foliage.

¹ General re-entry. ² Hand pruning. ³ Hand harvest. ⁴ Mechanical harvest. ⁵ Preharvest interval is 0 days for currants and 7 days for gooseberries.

— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Just before blossoms open						
DO NOT APPLY INSECTICIDES WHILE CURRANTS OR GOOSEBERRIES ARE IN BLOOM. SEE BEE POISONING, PAGE 5.						
Leaf spot	General Comments: - Two different fungi can cause leaf spot on currants: Anthracnose (<i>Drepanopeziza ribis</i>) and Septoria Leaf Spot (<i>Septoria ribis</i> = <i>Mycosphaerella ribis</i>). Leaf spots develop on susceptible varieties, reducing yield and vigour. - Rake or cultivate to bury old infected leaves before bud break. - If the disease was a problem the previous season, apply sprays at 7-day intervals in spring. Start when the first new leaf is fully open, and repeat as long as wet weather continues. - Postharvest sprays applied in the fall may also help to reduce overwintering inoculum.					
	M	Copper 53 W * plus hydrated lime	5 kg/1,000 L water plus 4 kg lime/1,000 L	48 hours	2 days	Refer to label for specific handling and storage requirements. This mixture is incompatible with all other insecticides and fungicides.
		Ferbam 76 WDG	6.75 kg/ha	12 hours	14 days	Currants only.
	3	Proline 480 SC	315 mL/ha	24 hours	7 days	Septoria leaf spot only. Suppression only.
	7	Sercadis	250–666 mL/ha	12 hours	0 days	Septoria leaf spot only.
Powdery mildew	General Comments: - Resistant varieties are available. See Table 3–5. <i>Disease Ratings on Selected Currant and Gooseberry Varieties</i>, page 124. - Prune out infected twig tips in fall and avoid excessive nitrogen. - If warm and humid conditions persist, spray weekly until fruit begins to colour. Apply before symptoms develop.					
	M	Microscopic Sulphur WP *	5 kg/ha	24 hours	1 day	Do not use within 14 days of Purespray Green Spray Oil and 30 days of Vegol Crop Oil.
	3	Mettle 125 ME	219–365 mL/ha	12 hours	14 days	Gooseberries only.
		Nova	340 g/ha	12 hours	6 days ³ / 1 day ⁴	No product specific comments.
	7+9	Luna Tranquility	1.2 L/ha	12 hours	0 days/ 7 days ⁵	Use once then rotate to a different fungicide group.
	7+11	Pristine WG	1.6 kg/ha	when dry ¹ / 29 days ³	0 days	Suppression only. Do not tank-mix or make sequential applications with Exirel.
	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	Suppression only. Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Supra Captan, Maestro or sulphur.

¹ General re-entry. ² Hand pruning. ³ Hand harvest. ⁴ Mechanical harvest. ⁵ Preharvest interval is 0 days for currants and 7 days for gooseberries.

— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Just before blossoms open						
DO NOT APPLY INSECTICIDES WHILE CURRANTS OR GOOSEBERRIES ARE IN BLOOM. SEE BEE POISONING, PAGE 5.						
Powdery mildew (cont'd)	NC	Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	Suppression only. Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Supra Captan, Maestro or copper and 30 days of sulphur. Do not apply to wet foliage.
Botrytis grey mould	General Comments: - Botrytis infection during bloom causes early fruit drop, or “runoff” in currants. - Apply fungicides at First bloom and make subsequent applications at 7–10-day intervals during bloom.					
	7	Cantus WDG	560 g/ha	12 hours	0 days	Suppression only (Sercadis). Use once and then rotate to a different fungicide group.
		Kenja 400 SC	0.987–1.24 L/ha	12 hours	7 days	
		Sercadis	250–666 mL/ha	12 hours	0 days	
	7+9	Luna Tranquility	1.2 L/ha	12 hours	0 days/ 7 days ⁵	Use once, then rotate to a different fungicide group.
	7+11	Pristine WG	1.3–1.6 kg/ha	when dry ¹ / 29 days ³	0 days	Use once, then rotate to a different fungicide group. Do not tank-mix or make sequential applications with Exirel.
	9	Scala SC	2 L/ha	12 hours	7 days	Gooseberries only.
	9+12	Switch 62.5 WG	775–975 g/ha	12 hours	1 day	No product specific comments.
	17	Elevate 50 WDG	1.7 kg/ha	4 hours	1 day	No product specific comments.
	44	Serenade OPTI *	1.7–3.3 kg/ha	when dry	0 days	Suppression only. For best results, use multiple applications or rotate with other products.
White pine blister rust	General Comments: Apply at the first sign of disease development and reapply in 7–14 days.					
	M	Cueva	5 L in 500 L water/ha	4 hours	1 day	Use a 1% solution v/v, in 470–940 L water/ha.
	3	Nova	340 g/ha	12 hours	6 days ³ / 1 day ⁴	Apply with a minimum of 250 L water/ha.
Bloom						
Botrytis grey mould	Apply one of the products listed for Botrytis grey mould at Just before blossoms open .					
White pine blister rust	Apply one of the products listed for White pine blister rust at Just before blossoms open .					

¹ General re-entry. ² Hand pruning. ³ Hand harvest. ⁴ Mechanical harvest. ⁵ Preharvest interval is 0 days for currants and 7 days for gooseberries.

— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Green fruit						
Currant fruit fly	At the time of printing this publication, there are no products registered for this pest.					
Leaf spot	M	Copper 53 W * plus hydrated lime	5 kg/1,000 L water plus 4 kg/1,000 L water	48 hours	2 days	Refer to label for specific handling and storage requirements. This mixture is incompatible with all other insecticides and fungicides.
	3	Proline 480 SC	315 mL/ha	24 hours	7 days	Septoria leaf spot only. Suppression only.
	7	Sercadis	250–666 mL/ha	12 hours	0 days	Septoria leaf spot only.
Powdery mildew	Use one of the products listed for Powdery mildew at Just before blossoms open .					
Leafhoppers	General Comments: Monitor for leaf curling on new growth. Spray red and white currants immediately after fruit is picked.					
	4A	Admire 240 Flowable	175 mL/ha	24 hours	3 days	Highly toxic to bees exposed to direct treatment or to residues on blooming crops and weeds. Refer to label for specific bee toxicity statements. Maximum 2 applications of Group 4A products per season.
Aphids	General Comments: - Monitor for leaf curling on new growth. Spray red and white currants immediately after fruit is picked. - Some of these products are highly toxic to bees exposed to direct treatment or to residues on blooming crops and weeds. Refer to label for bee toxicity statements.					
	4A	Admire 240 Flowable	175 mL/ha	24 hours	3 days	Also labelled as a soil application for white grubs. See label for this additional use. Do not use both soil and foliar applications in the same year. Maximum 2 applications of products from Group 4A per season. Toxic to certain beneficial insects.
		Assail 70 WP	56–86 g/ha	12 hours ¹ / 48 hours ²	7 days	Maximum 2 applications of products from Group 4A per season. Toxic to certain beneficial insects.
	4D	Sivanto Prime	500–750 mL/ha	12 hours	3 days	Toxic to certain beneficial insects. Where possible, rotate with products outside of Group 4.
	23	Movento 240 SC	220–365 mL/ha	12 hours	7 days	Postbloom use only.
	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	Feeding deterrent only. See comments on this product for Aphids at Just before blossoms open .
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	See comments on this product for Aphids at Just before blossoms open .

¹ General re-entry. ² Hand pruning. ³ Hand harvest. ⁴ Mechanical harvest. ⁵ Preharvest interval is 0 days for currants and 7 days for gooseberries.
 — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Green fruit						
Obliquebanded leafroller	General Comments: This pest is rarely a problem on currants and gooseberries.					
	5	Entrust * or Success	267–364 mL/ha 145–182 mL/ha	when dry	3 days	Also control spanworms or other leafrollers. See label for complete list of pests.
	11	Bioprotec CAF * or Dipel 2X DF *	1.4–2.8 L/ha 525–1,125 g/ha	12 hours	0 days	Product must be consumed to be effective. Spray when and where pests are actively feeding. Make 2 applications 5–7 days apart, when larvae are very small. Death of insect may take several days. Acidify spray mix to below pH 7.0 and apply on cloudy days or in the evening.
	18	Intrepid	0.5 L/ha	12 hours	7 days	Also controls spanworms or other leafrollers. See label for complete list of pests.
	28	Exirel	0.5–1.0 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Supra Captan or Maestro. See product label for numerous other tank-mix restrictions. Also controls spanworms or other leafrollers. See label for complete list of pests.
Postharvest						
Aphids	Use one of the products listed for Aphids at Green fruit .					
Leafhoppers	Use one of the products listed for Leafhoppers at Green fruit .					
Japanese beetle	General Comments: - Japanese beetle is not usually a problem on currants. - Apply pre- or postharvest if necessary.					
	28	Altacor	285 g/ha	12 hours	1 day	Suppression only.
		Exirel	1.0–1.5 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Supra Captan or Maestro. See product label for numerous other tank-mix restrictions.
Leaf spot, Powdery mildew	If leaf spot or powdery mildew continues to be a problem, spray after harvest with a product listed for these diseases at Green fruit to avoid premature defoliation.					

¹ General re-entry. ² Hand pruning. ³ Hand harvest. ⁴ Mechanical harvest. ⁵ Preharvest interval is 0 days for currants and 7 days for gooseberries.

— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–4. Products Used on Currants and Gooseberries

Use this table as a guide but refer to product label for specific information.

The **preharvest interval** is the number of days between the last spray and first harvest.

The **restricted entry interval** is the minimum interval that must be observed between the application of the pesticide and work in the treated crop without protective equipment. If no re-entry period is stated on the label, assume it is 12 hours.

The **maximum applications** is the labelled maximum number or product amount applied for the growing season and may be higher than what is recommended for resistance management or for the preservation of beneficial insects and mites.

Products listed as **potentially organic** may be acceptable for organic use based on *Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec publication Bulletin D'Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with certifying body to verify the acceptability of any product prior to using it.

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic	Honeybee Toxicity†
Products used for insect and mite control or suppression								
Admire 240 Flowable	24094	imidacloprid	4A	3 days	24 hours	2 ¹	—	HT
Altacor	28981	chlorantraniliprole	28	1 day	12 hours	3 (max. 645 g/ha)	—	NT
Assail 70 WP	27128	acetamiprid	4A	7 days	12 hours ² /48 hours ³	4	—	MT
Bioprotec CAF	26854	<i>Bacillus thuringiensis</i>	11	0 days	12 hours	—	✓	NT
Dipel 2X DF	26508	<i>Bacillus thuringiensis</i>	11	0 days	12 hours	—	✓	NT
Entrust	30382	spinosad	5	3 days	when dry	3	✓	HT
Exirel	30895	cyantraniliprole	28	3 days	12 hours	4 (max 4.5 L/ha)	—	HT
Intrepid	27786	methoxyfenozide	18	7 days	12 hours	4	—	NT
Movento 240 SC	28953	spirotetramat	23	7 days	12 hours	max 1.8 L/ha	—	HT **
Purespray Green Spray Oil 13 E *	27666	mineral oil	NC	—	12 hours	8	✓	—
Sivanto Prime	31452	flupyradifurone	4D	3 days	12 hours	2 L/ha	—	MT
Success	26835	spinosad	5	3 days	when dry	3	—	HT
Vegol Crop Oil	32408	canola oil	NC	0 days	12 hours	2/4 ⁴	✓	—

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. — = Information is not specified on the product label. ✓ = Potentially organic. Check with certifying body.

¹ Foliar application. ² General re-entry. ³ Hand pruning. ⁴ Maximum 6 applications per season with no more than 2 dormant applications. ⁵ Registered for currants only, not gooseberries.

⁶ Preharvest interval is 0 days for currants or 7 days for gooseberries. ⁷ Maximum of 2 applications per year for botrytis or maximum 4 L/ha per year for powdery mildew. ⁸ Registered for gooseberries only, not currants. ⁹ Hand harvest. ¹⁰ Mechanical harvest.

HT = Highly toxic to bees. Severe losses may be expected if used when bees are present at treatment time or within a few days thereafter.

MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.

NT = Relatively non-toxic to bees.

† Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

** Movento may be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

Table 3–4. Products Used on Currants and Gooseberries (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic	Honeybee Toxicity [†]
Products used for disease control or suppression								
Cantus WDG	30141	boscalid	7	0 days	12 hours	4	—	NT
Cueva	31825	copper octanoate	M	1 day	4 hours	—	—	NT
Copper 53 W	9934	tribasic copper sulphate	M	2 days	48 hours	4	—	MT
Elevate 50 WDG	25900	fenhexamid	17	1 day	4 hours	4	—	NT
Ferbam 75 WDG ⁵	20136	ferbam	M	14 days	12 hours	—	—	NT
Kenja 400 SC	31758	isofetamid	7	7 days	12 hours	3	—	NT
Luna Tranquility	30510	fluopyram + pyrimethanil	7+9	0 days/7 days ⁶	12 hours	2/max. 4 L/ha ⁷	—	NT
Mettle 125 ME ⁸	30673	tetraconazole	3	14 days	12 hours	2	—	NT
Microscopic Sulphur WP	14653	sulphur	M	1 day	24 hours	8	✓	NT
Nova	22399	myclobutanil	3	6 days ⁹ /1 day ¹⁰	12 hours	3	—	NT
Pristine WG	27985	boscalid + pyraclostrobin	7+11	0 days	when dry ² /29 days ⁹	4	—	NT
Proline 480 SC	28359	prothioconazole	3	7 days	24 hours	2	—	NT
Purespray Green Spray Oil 13 E	27666	mineral oil	NC	—	12 hours	8	✓	—
Scala SC ⁸	28011	pyrimethanil	9	7 days	12 hours	3	—	NT
Sercadis	31697	fluxapyroxad	7	0 days	12 hours	3	—	NT
Serenade OPTI	31666	<i>Bacillus subtilis</i>	44	0 days	when dry	—	✓	NT
Switch 62.5 WG	28189	cyprodinil + fludioxonil	9+12	1 day	12 hours	3	—	NT
Vegol Crop Oil	32408	canola oil	NC	0 days	12 hours	2/4 ⁴	✓	—

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. — = Information is not specified on the product label. ✓ = Potentially organic. Check with certifying body.

¹ Foliar application. ² General re-entry. ³ Hand pruning. ⁴ Maximum 6 applications per season with no more than 2 dormant applications. ⁵ Registered for currants only, not gooseberries.

⁶ Preharvest interval is 0 days for currants or 7 days for gooseberries. ⁷ Maximum of 2 applications per year for botrytis or maximum 4 L/ha per year for powdery mildew. ⁸ Registered for gooseberries only, not currants. ⁹ Hand harvest. ¹⁰ Mechanical harvest.

HT = Highly toxic to bees. Severe losses may be expected if used when bees are present at treatment time or within a few days thereafter.

MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.

NT = Relatively non-toxic to bees.

† Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

** Movento may be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

Notes on Currant and Gooseberry Diseases

In this section:

Table 3–5. *Disease Ratings on Selected Currant and Gooseberry Varieties, on this page.*

Table 3–5. Disease Ratings on Selected Currant and Gooseberry Varieties

Type	Variety	Mildew Resistance	Rust Resistance
Black currant	Ben Alder	resistant	very susceptible
	Ben Connan	resistant	moderately resistant
	Ben Sarek	resistant	moderately resistant
	Titania	immune	immune
Red currant	Red Lake	susceptible	susceptible
	Rovada	resistant	moderately resistant
	Jonkheer van Tets	moderately resistant	resistant
Gooseberry	Captivator	moderately resistant	—
	Invicta	moderately resistant	moderately resistant
	Hinnonmaki Red	resistant	moderately resistant

Resistant = Does not show symptoms of rust (only Titania has genetic resistance).

Moderately resistant = Shows symptoms at low frequency, yield not affected.

Susceptible = Noticeable levels of rust infection, not affecting yield.

Very susceptible = Severe infection, affecting yield.

— = Information is not available.

Source:

Adam Dale, HortTechnology 10(3) 2000, pg. 553.

Hummer and Barney, HortTechnology 12(3) 2002, pp. 382–383, or *Currants, Gooseberries, Jostaberries, Guide for Growers*. Food Products Press 2005.

Dick McGinnis, McGinnis Berry Crops, B.C., personal communication.

SUMMER-FRUITING RASPBERRY AND BLACKBERRY CALENDAR

In this section:

- Read the product label and follow all safety precautions. 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>.
- Unless specified on the product label, use enough water to ensure thorough spray coverage. Where the product rate is listed in amount per 1,000 L and if a water volume is not provided on the label, use enough water to wet the foliage to the near-drip point.
- For preharvest interval, restricted entry interval, and maximum number of applications, see Table 3–6. *Products Used on Raspberries and Blackberries*, page 145.
- **Products are listed by chemical group and in alphabetical order within each group. The order does not reflect efficacy.** See Table 3–7. *Activity of Fungicides on Raspberry Diseases and Impact on Honeybees*, page 148 and Table 3–8. *Activity of Insecticides on Raspberry Pests and Impact on Honeybees*, page 150, for efficacy ratings.
- Where a product in the calendar is followed by a “*”, it is potentially acceptable for organic use based on *Ministère de l’Agriculture, des Pêcheries et de l’Alimentation du Québec publication Bulletin D’Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with your certifying body to verify the acceptability of any product prior to using it.

Resistance Management

To delay development of resistance to fungicides, insecticides and miticides, follow resistance management guidelines outlined in *Resistance Management Strategies*, page 393. The chemical group is indicated in the column before the product name. Products belonging to the same chemical group are grouped together in the calendar. Multi-site (M) fungicides are not prone to resistance and do not have to be rotated. Some products are not classified to mode of action (NC) and the mode of action has not been determined for others (U or UN).

Fungicide resistance management

Take the following steps to avoid rapid development of fungicide resistance:

- Do not reduce rates below those specified on the label.
- Do not use products containing the same chemical group in consecutive applications.
- Use products containing only one chemical family no more than twice per season.
- Use co-formulations or products that must be tank-mixed with another chemical group no more than 3 times per season.
- Use sufficient water to provide thorough coverage.

Insecticide resistance management

Take the following steps to avoid development of insecticide resistance:

- For pests with discrete generations (obliquebanded leafroller), do not use insecticides from the same group for more than one generation. Within a generation, if more than one spray is required, use a product from the same chemical group.
- For pests with rapidly building and overlapping generations (mites, aphids), do not use products containing the same chemical group in consecutive applications.

Bee Toxicity

Some insecticides are toxic to bees and other pollinating insects. Use of insecticides on flowering crops requires careful management to avoid negative effects on pollinators. Some insecticides cannot be applied prior to or during bloom. For others, use extreme caution when applying insecticides to raspberries or blackberries during bloom—do not apply them while bees are active. Before and after bloom, bees may still be present on flowering cover crops and weeds—do not allow drift of insecticides onto these or other flowering crops. Always follow label precautions regarding avoiding impacts on bees. For more information, see *Bee Poisoning*, page 5, and honeybee toxicity ratings in Table 3–7. *Activity of Fungicides on Raspberry Diseases and Impact on Honeybees*, page 148 and Table 3–8. *Activity of Insecticides on Raspberry Pests and Impact on Honeybees*, page 150.

Buffer Zones

Leave a suitable buffer zone between treatment area and adjacent sensitive areas, such as hedgerows, woodlots and freshwater habitats. Zones may vary depending on the product used, growth stage of the crop and method of application including the use of drift-reducing technology. Check the pesticide label for requirements.

Use Health Canada's online spray drift calculator to modify the buffer zone specified on the label based on weather conditions, category of spray equipment and 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. Unfortunately, this model does not account for carrier volume, travel speed or crop stage.

Observing buffer zones is a legal requirement. A record of the buffer zone modification, if any, must be retained for at least one year from the time of application.

Crop Nutrition

Crop nutrition is important for plant growth and fruit quality on berry crops. Soil testing, plant tissue analysis and visual deficiency symptoms all play an important role in assessing and monitoring the crop's nutritional status. For more information, visit <http://www.omafra.gov.on.ca/english/crops/hort/berry.html> (click on *Soil Management, Fertilizer Use, Crop Nutrition and Cover Crops for Fruit Production*) and see OMAFRA Publication 611, *Soil Fertility Handbook*. For soil testing and plant tissue analysis services, see Appendix E: *Accredited Soil-Testing Laboratories in Ontario*, page 435.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Before planting						
Root lesion nematode, Phytophthora root rot	NC	MustGrow *	1,121–2,240 kg/ha	24 hours ¹	—	Suppression only. Apply with a calibrated spreader, in early spring, when soil temperatures are above 10°C, but at least 2 weeks before planting. Incorporate into the upper soil layer to a depth of 10–15 cm, followed by irrigation to ensure the top 10–15 cm of soil is well-moistened.
Delayed dormant to green tip						
Spur blight, Cane blight, Rust	General Comments: This timing reduces overwintering inoculum and is the first step in a good disease control program.					
	M	Lime Sulphur	26 L/1,000 L water	48 hours	1/4 inch green	Raspberries only. Apply in a high-volume spray to ensure thorough coverage to point of near drip. Do not use later than 1/4-inch green. Do not spray on wet foliage.
Early bud break						
Phytophthora root rot	4	Ridomil Gold 480 SL	37 mL/100 m of row	12 hours	prebloom	Raspberries only. Use in non-bearing plantings only. Apply as a soil drench after planting in a 1 m band centred over the row. Use at least 2,500 L water/ha. Reapply mid to late October (before the ground is frozen). In established plantings, apply in the fall only at Postharvest .
	33	Aliette	5.50 kg/ha	when dry	60 days	Use as a preventive treatment. Do not tank-mix with copper, foliar fertilizers or surfactants. Apply after bud break at 7 cm of new growth. Reapply 3–4 weeks later, if needed.
		Phostrol	5.2 L/ha	12 hours	1 day	Raspberries only. Suppression only. Use as a preventive treatment. Do not tank-mix with copper, foliar fertilizers or surfactants. Apply after bud break at 7 cm of new growth. Reapply 3–4 weeks later, if needed.
Raspberry crown borer	General Comments: - If more than 5% of the crowns are infested, spray lower portions of canes and the crown area. - See Postharvest for more control options for this pest.					
	1B	Diazinon 500 E	1 L/1,000 L water	12 hours	prebloom	Apply in 4,000–5,000 L water/ha as a drench to crowns and base of plants. Apply in spring to control young larvae before they tunnel into crowns and when new growth is about 10 cm above ground. Do not apply after first bloom. Do not apply more than once a year. Treat infested plantings at least 2 years in a row.

¹ After activation with water in soil. ² General re-entry. ³ Hand labour (e.g., pruning, training, tying). ⁴ Hand harvest. ⁵ Blackberry. ⁶ Raspberry. ⁷ Mechanical harvest.

⁸ Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Prebloom (until blossoms open)						
Anthracnose, Spur blight	General Comments: Protect new growth. Apply when new canes are 25–30 cm tall and just before first bloom.					
	M	Ferbam 76 WDG	2.5 kg/1,000 L water	12 hours	prebloom	No product specific comments.
	11+27	Tanos 50 DF	840 g/ha	9 days	9 days	Do not tank-mix or make sequential applications with Exirel.
Powdery mildew	General Comments: In problem areas, spray when mildew is first observed. Reapply in 7–10 days.					
	1	Senator 50 SC	700 mL/1,000 L water	12 hours	1 day	Raspberries only.
	3	Nova	340 g/ha	12 hours	1 day ⁷ / 6 days ⁴	No product specific comments.
	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	Suppression only. Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Supra Captan, Maestro or sulphur.
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	Suppression only. Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Supra Captan, Maestro or copper and 30 days of sulphur. Do not apply to wet foliage.
Raspberry sawfly, Raspberry fruitworm	At the time of printing this publication, there are no products registered for these pests. See Table 3–8. <i>Activity of Insecticides on Raspberry Pests and Impact to Honeybees</i> , page 150, for products that may provide some activity on these pests.					
Obliquebanded leafroller	General Comments: Leafrollers are not usually a problem in Ontario. Substantial damage can occur without crop loss.					
	3	Capture 240 EC	467 mL/ha	12 hours	3 days	Raspberries only. Sequential applications must be at least 30 days apart.
	5	Delegate	200 g/ha	12 hours	1 day	Apply to eggs and small larvae.
		Entrust * or Success	267–364 mL/ha 145–182 mL/ha	when dry	1 day	
	11	Bioprotec CAF * or Dipel 2X DF * or Foray 48 BA	1.4–2.8 L/ha 525–1,125 g/ha 1.4–2.8 L/ha	12 hours	0 days	Raspberries only (Foray). Do not use on blackberries. Product must be consumed to be effective. Spray when and where pests are actively feeding. Make 2 applications 3–7 days apart, when larvae are very small. Death of insect may take several days. Acidify spray mix to below pH 7.0 and apply on cloudy days or in the evening.
	18	Intrepid	500–750 mL/ha	12 hours	3 days	Sequential applications must be at least 30 days apart.

¹ After activation with water in soil. ² General re-entry. ³ Hand labour (e.g., pruning, training, tying). ⁴ Hand harvest. ⁵ Blackberry. ⁶ Raspberry. ⁷ Mechanical harvest.

⁸ Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Prebloom (until blossoms open)						
Clipper weevil	1B	Malathion 85 E	1,345 mL/ha	24 hours	1 day	Raspberries only.
Aphids, Leafhoppers	3	Pyganic EC 1.4 II *	2.32–4.65 L/ha	12 hours	—	Apply when pests are first observed. Do not wait until plants are heavily infested. Reapply, if needed. For best results, use high rate, adjust spray solution to pH of 5.5–7.0, and apply promptly after mixing. If possible, apply in the early morning or evening hours. Do not use when bees or other beneficial insects are present.
	4A	Assail 70 WP	56–86 g/ha	12 hours	1 day	Use a 7-day interval between sprays. Under heavy pressure, use the high rate. Maximum 2 applications of Group 4A products per season.
	4D	Sivanto Prime	500–750 mL/ha	12 hours	0 days	Aphids only. Toxic to certain beneficial insects. Where possible, rotate with products outside of Group 4.
	NC	Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	Aphids only. Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Supra Captan, Maestro or copper and 30 days of sulphur. Do not apply to wet foliage.
Two-spotted spider mite	General Comments: - Beneficial mites can be introduced to prevent mite build-up. - Thorough coverage of both leaf surfaces is necessary for good control.					
	10	Apollo SC	500 mL/ha	12 hours ² / 10 days ³	15 days	Raspberries only. Kills mite eggs and young nymphs. Apply when mites are mostly in the egg stage.
	20	Kanemite 15 SC	2.07 L/ha	12 hours	1 day	This product acts quickly upon contact with mites. Apply when monitoring indicates mites are building up and mostly in the nymph stage.
	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	Suppression only. Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Supra Captan, Maestro or sulphur.
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Supra Captan, Maestro or copper and 30 days of sulphur. Do not apply to wet foliage.
	UN	Acramite 50 WS	851 g/ha	12 hours	1 day	This product acts quickly upon contact with mites. Apply when monitoring indicates mites are building up, and mostly in the nymph stage.

¹ After activation with water in soil. ² General re-entry. ³ Hand labour (e.g., pruning, training, tying). ⁴ Hand harvest. ⁵ Blackberry. ⁶ Raspberry. ⁷ Mechanical harvest.

⁸ Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Bloom						
DO NOT APPLY INSECTICIDES WHILE RASPBERRIES AND BLACKBERRIES ARE IN BLOOM. SEE BEE POISONING, PAGE 5.						
Botrytis grey mould	General Comments: Bloom is the most important time to control botrytis grey mould. Begin at 5%–10% bloom and if the weather is wet. Reapply every 7 days.					
	M	Maestro 80 DF or Supra Captan 80 WDG	2.5 kg/ha	72 hours	2 days	The rate on blackberry is 2.25 kg/ha. These products also control spur blight. Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Exirel or Timorex Gold.
	1	Senator 50 SC	700 mL/1,000 L water	12 hours	1 day	Raspberries only. Resistance develops rapidly. Tank-mix with a compatible Group M fungicide.
	2	Rovral WP	2 kg/ha	12 hours	1 day	Raspberries only.
	7	Cantus WDG	560 g/ha	12 hours	0 days	Suppression only (Sercadis). Use once then rotate to a different fungicide group.
		Kenja 400 SC	0.987–1.24 L/ha	12 hours	7 days	
		Sercadis	250–666 mL/ha	12 hours	0 days	
	7+11	Pristine WG	1.3–1.6 kg/ha	when dry ² /24 hours ^{3,4}	0 days	Use once then rotate to a different fungicide group. Do not tank-mix or make sequential applications with Exirel.
	9	Scala SC	2 L/ha	12 hours	0 days	Raspberries only.
	9+12	Switch 62.5 WG	775–975 g/ha	12 hours	1 day	No product specific comments.
	17	Elevate 50 WDG	1.7 kg/ha	4 hours	1 day	No product specific comments.
	44	Serenade OPTI *	1.7–3.3 kg/ha	when dry	0 days	Suppression only. For best results, use multiple applications or rotate with other products.
	46	Timorex Gold *	1.5–2.0 L/ha	4 hours	2 days	Apply in a high-volume spray to ensure thorough coverage Do not tank-mix or alternate with captan or sulphur products. See label for precautions on compatibility.
Fire blight	24	Kasumin 2L	5 L in 1,000 L water/ha	12 hours	1 day	Make the first application at the beginning of bloom and reapply every 3–4 days during bloom when conditions favour disease development. If using lower water volumes. refer to the water volume chart indicated on the label for rate recommendations.
Powdery mildew	Use one of the products listed for Powdery mildew at Prebloom (before blossoms open) .					
Green fruit						
Anthracnose, Spur blight, Cane botrytis	General Comments: - Ensure thorough spray coverage of primocanes in the row. Keep rows narrow by mowing primocanes as they emerge at the row edges. - Captan and Maestro used at this timing will also control spur blight.					
	11+27	Tanos 50 DF	840 g/ha	9 days	9 days	Do not tank-mix or make sequential applications with Exirel.

¹ After activation with water in soil. ² General re-entry. ³ Hand labour (e.g., pruning, training, tying). ⁴ Hand harvest. ⁵ Blackberry. ⁶ Raspberry. ⁷ Mechanical harvest.
⁸ Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

¹ After activation with water in soil. ² General re-entry. ³ Hand labour (e.g., pruning, training, tying). ⁴ Hand harvest. ⁵ Blackberry. ⁶ Raspberry. ⁷ Mechanical harvest.

⁸ Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Green fruit						
Obliquebanded leafroller	Use one of the products listed for Obliquebanded leafroller at Prebloom (until blossoms open) .					
Aphids	3	Pyganic EC 1.4 II *	2.32–4.65 L/ha	12 hours	—	See comments on this product for Aphids at Prebloom (until blossoms open) .
	4A	Assail 70 WP	56–86 g/ha	12 hours	1 day	Use a 7-day interval between sprays. Under heavy pressure, use the high rate. Maximum 2 applications of Group 4A products per season.
	4D	Sivanto Prime	500–750 mL/ha	12 hours	0 days	Toxic to certain beneficial insects. Where possible, rotate with products outside of Group 4.
	NC	Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	See comments on this product for Aphids at Prebloom (until blossoms open) .
Japanese beetle	1A	Sevin XLR	5.25 L/ha	6 days ² / 10 days ^{3,4}	11 days	Apply when adults appear and reapply as necessary at 7–10-day intervals.
Rose chafers	1B	Malathion 85 E	610–975 mL/ 1,000 L water	12 hours	7 days	Blackberries only.
Leafhoppers	General Comments: - Potato leafhopper can be a problem when nearby hay fields are mowed. New plantings are especially susceptible. Leafhoppers feed on primocane leaves and cause new growth to turn yellow and curl under. - Monitor for small green nymphs on lower leaf surface. Spray when nymphs are present and symptoms are evident. - These products are highly toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements.					
	1B	Malathion 85 E	880 mL/ha	12 hours ⁵ / 24 hours ⁶	1 day ⁶ / 7 days ⁵	Rate for blackberries is 610–975 mL/ha.
	3	Pyganic EC 1.4 II *	2.32–4.65 L/ha	12 hours	—	Apply when pests are first observed. Do not wait until plants are heavily infested. Reapply, if needed. For best results, use high rate, adjust spray solution to pH of 5.5–7.0, and apply promptly after mixing. If possible, apply in the early morning or evening hours. Do not use when bees or other beneficial insects are present. Also controls aphids.
	4A	Admire 240 Flowable or Alias 240 SC	175 mL/ha	24 hours	4 days	Apply in 300 L water/ha as a foliar spray. Under high pressure, may provide suppression rather than control. Also controls aphids. Maximum 2 applications of Group 4A products per season
		Assail 70 WP	56–86 g/ha	12 hours	1 day	Use a 7-day interval between sprays. Under heavy pressure, use the high rate. Maximum 2 applications of Group 4A products per season.

¹ After activation with water in soil. ² General re-entry. ³ Hand labour (e.g., pruning, training, tying). ⁴ Hand harvest. ⁵ Blackberry. ⁶ Raspberry. ⁷ Mechanical harvest.

⁸ Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Green fruit						
Raspberry cane borer	General Comments: - Raspberry cane borer makes 2 rings of puncture marks around the top of the cane, causing the primocane to wilt. - Spray to control beetles when damage is first observed.					
	4A	Admire 240 Flowable or Alias 240 SC	467 mL/ha	24 hours	4 days	Suppression only. Do not apply prebloom, during bloom, or when bees are actively foraging. Apply in 300 L water/ha as a foliar spray. Maximum 2 applications of Group 4A products per season
	28	Altacor	215–285 g/ha	12 hours	3 days	Apply soon after damage first appears.
Red-necked cane borer	General Comments: - Red-necked cane borer attacks the lower primocane, causing canes to break off 0.5–1.0 m above the ground later in the season. - If there is a history of this pest, spray when beetles are active.					
	4A	Admire 240 Flowable or Alias 240 SC	467 mL/ha	24 hours	4 days	Suppression only. Do not apply Prebloom , during bloom, or when bees are actively foraging. Apply in 300 L water/ha as a foliar spray. Maximum 2 applications of products from Group 4A per season.
White grubs (larvae of European chafer)	General Comments: Apply in young plants where populations are high.					
	4A	Admire 240 Flowable or Alias 240 SC	1.2 L/ha	24 hours	14 days	Reduction in numbers only. Apply just prior to egg hatch (shortly after adults are active) to damp soil in the plant row and in the alleys. Use in 200 L water/ha. Move the product into the root zone with 5–10 mm irrigation within 24 hours of application. Do not apply Prebloom , during bloom, or when bees are actively foraging. Maximum 2 applications of products from Group 4A per season.
Two-spotted spider mite	General Comments: - Beneficial mites can be introduced to prevent mite build-up. - Thorough coverage of both leaf surfaces is necessary for good control.					
	20	Kanemite 15 SC	2.07 L/ha	12 hours	1 day	This product acts quickly on contact with mites. Apply when monitoring indicates mites are building up, and mostly in the nymph stage.
	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	See comments on this product for Two-spotted spider mite at Prebloom .
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	See comments on this product for Two-spotted spider mite at Prebloom .
	UN	Acramite 50 WS	851 g/ha	12 hours	1 day	This product acts quickly upon contact with mites. Apply when monitoring indicates mites are building up, and mostly in the nymph stage.

¹ After activation with water in soil. ² General re-entry. ³ Hand labour (e.g., pruning, training, tying). ⁴ Hand harvest. ⁵ Blackberry. ⁶ Raspberry. ⁷ Mechanical harvest.

⁸ Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Preharvest and harvest						
Spotted wing drosophila	General Comments: - Spotted wing drosophila inserts eggs into ripening fruit. Larvae develop in the fruit and may be present at harvest, contributing to premature breakdown. - Weekly insecticides are recommended when fruit is ripening or ripe and flies are present. Rotate between products from different groups. - Frequent picking, burial of grade-out fruit and general sanitation are very important to prevent problems. - These products rely on contact in order to control spotted wing drosophila adults. Apply in a high-volume spray to ensure thorough coverage of fruit. - These products are toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements. - Emergency use registration of other products is expected. Check ontario.ca/spottedwing for updates on pest development, registered products and management strategies for control.					
	5	Delegate	315–420 g/ha	12 hours	1 day	Use high rate and shorten interval between applications under high pest pressure.
		Entrust * or Success	334–440 mL/ha 165–220 mL/ha	when dry	1 day	
	28	Exirel	1.0–1.5 L/ha	12 hours	1 day	Use high rate and shorten intervals between applications under heavy pressure. Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Supra Captan or Maestro. See product label for numerous other tank-mix restrictions.
Spanworms	General Comments: Spanworms, also known as inch-worms or loopers, appear just before harvest on raspberry fruit.					
	5	Entrust * or Success	267–364 mL/ha 145–182 mL/ha	when dry	1 day	No product specific comments.
Earwigs, weevils	3	Capture 240 EC	467 mL/ha	12 hours	3 days	Toxic to certain beneficial insects. Repeated use of pyrethroid (Group 3) can lead to spider mite outbreaks.
Botrytis grey mould	General Comments: Although bloom is the most important time to control botrytis grey mould, preharvest sprays are required if the weather is wet.					
	M	Maestro 80 DF or Supra Captan 80 WDG	2.5 kg/ha	72 hours	2 days	Also controls spur blight. The rate on blackberry is 2.25 kg/ha. Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Exirel or Timorex Gold.
	1	Senator 50 SC	700 mL/1,000 L water	12 hours	1 day	Raspberries only. Resistance develops rapidly. Tank-mix with a compatible Group M fungicide.
	2	Rovral WP	2 kg/ha	12 hours	1 day	Raspberries only.
	7	Cantus WDG	560 g/ha	12 hours	0 days	Suppression only (Sercadis). Use once, then rotate to a different fungicide group.
		Kenja 400 SC	0.987–1.24 L/ha	12 hours	7 days	
		Sercadis	250–666 mL/ha	12 hours	0 days	
	7+11	Pristine WG	1.3–1.6 kg/ha	when dry ² / 24 hours ^{3,4}	0 days	Use once, then rotate to a different fungicide group. Do not tank-mix or make sequential applications with Exirel.

¹ After activation with water in soil. ² General re-entry. ³ Hand labour (e.g., pruning, training, tying). ⁴ Hand harvest. ⁵ Blackberry. ⁶ Raspberry. ⁷ Mechanical harvest.

⁸ Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Preharvest and harvest						
Botrytis grey mould (cont'd)	9	Scala SC	2 L/ha	12 hours	0 days	Raspberries only.
	9+12	Switch 62.5 WG	775–975 g/ha	12 hours	1 day	No product specific comments.
	17	Elevate 50 WDG	1.7 kg/ha	4 hours	1 day	No product specific comments.
	44	Serenade OPTI *	1.7–3.3 kg/ha	when dry	0 days	Suppression only. For best results, use multiple applications or in rotation with other products.
	46	Timorex Gold *	1.5–2.0 L/ha	4 hours	2 days	Apply in a high-volume spray to ensure thorough coverage. Do not tank-mix or alternate with captan or sulphur products. See label for precautions on compatibility.
Postharvest						
Anthracnose, Spur blight, Cane botrytis	General Comments: Ensure thorough spray coverage of primocanes in the row. Narrow rows and good weed control will reduce disease pressure in the row by allowing air flow and faster drying.					
	11+27	Tanos 50 DF	840 g/ha	9 days	9 days	Apply once or twice after harvest to protect primocanes.
Leaf spot	General Comments: Raspberry leaf spot can cause severe defoliation on some varieties. Postharvest fungicides are important for control of this disease.					
	7	Sercadis	250–666 mL/ha	12 hours	0 days	No product specific comments.
Phytophthora root rot	General Comments: Apply after harvest when conditions favour disease development (high soil moisture and cool temperatures).					
	4	Ridomil Gold 480 SL	37 mL/100 m of row	12 hours	post-harvest	Raspberries only. Apply as a soil drench in a 1 m band centred over the row. Use at least 2,500 L of water/ha. Apply before mid to late October (before the ground is frozen).
	21	Torrent 400 SC	250 mL/ha	12 hours	90 days	Apply as a soil drench in up to 1,000 L water/ha. Do not use with a surfactant.
	33	Aliette	5.5 kg/ha	when dry	60 days	Apply to foliage. Reapply 3–4 weeks later, if needed, at least 30 days before leaf drop.
		Phostrol	5.2 L/ha	12 hours	1 day	Raspberries only. Suppression only. Apply to foliage. Reapply 3–4 weeks later, if needed, at least 30 days before leaf drop.
Aphids	4A	Assail 70 WP	56–86 g/ha	12 hours	1 day	Use a 7-day interval between sprays. Under heavy pressure, use the high rate. Maximum 2 applications of products from Group 4A per season.
	23	Movento 240 SC	220–365 mL/ha	12 hours	3 days	Apply postbloom in a minimum of 300 L water/ha when aphids are first observed.

¹ After activation with water in soil. ² General re-entry. ³ Hand labour (e.g., pruning, training, tying). ⁴ Hand harvest. ⁵ Blackberry. ⁶ Raspberry. ⁷ Mechanical harvest.

⁸ Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Postharvest						
Leafhoppers	General Comments: Some of these products are toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements.					
	1B	Malathion 85 E	880 mL/ha	12 hours ⁵ / 24 hours ⁶	1 day ⁶ / 7 days ⁵	Rate for blackberries is 610–975 mL/ha.
	4A	Admire 240 Flowable or Alias 240 SC	175 mL/ha	24 hours	4 days	Apply in 300 L water/ha. Under high pressure, may provide suppression rather than control. Also controls aphids. Maximum 2 applications of products from Group 4A per season.
		Assail 70 WP	56–86 g/ha	12 hours	1 day	Use a 7-day interval between sprays. Under heavy pressure, use the high rate. Maximum 2 applications of products from Group 4A per season.
	NC	Surround WP *	25 kg/ha	12 hours	1 day	Raspberries only. Efficacy depends on complete coverage of leaves. Apply at 7–14-day intervals when leafhoppers are first detected by monitoring. For early applications, use 25 kg/500 L of water. Once a base coat is established, rate can be reduced for follow-up applications to 12.5 kg/500 L of water. Do not use when fruit is present or during bloom. Light to moderate rain will help distribute product. Reapply after heavy rain, strong wind or overhead irrigation. Do not use with anti-foaming agents, spreader/stickers or oil.
Two-spotted spider mite	General Comments: - Check lower leaf surface for mites and webbing. - Thorough spray coverage of the lower leaf surface is required. - Beneficial mites can be introduced to prevent mite build-up. - For resistance management, alternate miticides between years.					
	6	Agri-Mek SC	225 mL/ha	12 hours	post-harvest	Apply with a non-ionic surfactant at a rate of 0.1–0.5% v/v (1.0–5.0 L/1,000 L water). See Table 3–15. <i>Adjuvants Used in Ontario</i> , page 211.
	20	Kanemite	2.07 L/ha	12 hours	1 day	This product acts quickly on contact with mites. Apply when monitoring indicates mites are building up, and mostly in the nymph stage.
	21	Nexter	600 g/ha	24 hours	post-harvest	Raspberries only.
	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	Suppression only. See comments on this product for Two-spotted spider mite at Prebloom .
	UN	Acramite 50 WS	851 g/ha	12 hours	1 day	This product acts quickly on contact with mites. Apply when monitoring indicates mites are building up, and mostly in the nymph stage.
¹ After activation with water in soil. ² General re-entry. ³ Hand labour (e.g., pruning, training, tying). ⁴ Hand harvest. ⁵ Blackberry. ⁶ Raspberry. ⁷ Mechanical harvest. ⁸ Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.						

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Postharvest						
White grubs (larvae of European chafer)	General Comments: Apply in young plantings where populations are high.					
	4A	Admire 240 Flowable or Alias 240 SC	1.2 L/ha	24 hours	14 days	Reduction in numbers only. Apply to damp soil in the plant row and in the alleys. Use in 200 L water/ha. Move the product into the root zone with 5–10 mm irrigation within 24 hours of application. Maximum 2 applications of products from Group 4A per season. Highly toxic to bees exposed to direct treatment or to residues on blooming crops and weeds. Read the specific bee toxicity statements on the label.
Raspberry crown borer	General Comments: - If more than 5% of the crowns are infested, spray lower portions of canes and the crown area. Treat infested plantings at least 2 years in a row. - Apply in late summer or early fall at egg hatch to first-instar larvae when they are actively feeding in the cambium, before they tunnel into the crown or canes.					
	28	Altacor	215–285 g/ha	12 hours	3 days	Reapply, if necessary, at 14-day intervals. Apply in a high-volume spray to ensure thorough coverage to base of primocanes. Use high rate under high pest pressure.
Special sprays						
These diseases are not common in Ontario. Spray varieties or areas where problems have occurred in the past.						
Yellow rust	General Comments: - There are several different rust diseases on raspberries: late leaf rust, yellow rust and orange rust. Late leaf rust and orange rust are the most common in Ontario; yellow rust is rarely seen. These products are only registered for yellow rust. - Apply in spring at first sign of disease on developing leaves. Reapply 14 days later.					
	3	Nova	175 g/ha	12 hours	1 day ⁷ / 6 days ⁴	No product specific comments.
		Bumper 432 EC or Fitness or Jade or Tilt 250 E	300 mL/ha 300 mL/ha 500 mL/ha 500 mL/ha	12 hours 4 hours ⁸ /72 hours ² 72 hours 12 hours	30 days	Apply in a minimum of 500 L water/ha.
Downy mildew	General Comments: - Downy mildew causes small red spots, extending along the veins, and leaf distortion. White-grey spore masses are produced on the underside of leaves, under the red spots. Infected fruit becomes dry and shrivelled. - Remove suckers early to reduce spore production potential.					
	33	Rampart	3–8 L/ha	4 hours	—	Blackberries only. Suppression only. Apply in early spring when conditions favour disease (cool, wet) but before symptoms develop. Apply in a high-volume spray to ensure thorough coverage of lower leaves as primocanes emerge. Reapply as needed.

¹ After activation with water in soil. ² General re-entry. ³ Hand labour (e.g., pruning, training, tying). ⁴ Hand harvest. ⁵ Blackberry. ⁶ Raspberry. ⁷ Mechanical harvest.

⁸ Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

FALL-BEARING RASPBERRY CALENDAR (PRIMOCANE FRUITING)

In this section:

- This calendar is for primocane-fruiting raspberry varieties that fruit on the tips of the current year's growth and are mowed annually.
- Read the product label and follow all safety precautions. 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>.
- Unless specified on the product label, use enough water to ensure thorough spray coverage. Where the product rate is listed in amount per 1,000 L and if a water volume is not provided on the label, use enough water to wet the foliage to the near-drip point.
- For preharvest interval, restricted entry interval and maximum number of applications, see Table 3–6. *Products Used on Raspberries and Blackberries*, page 145.
- **Products are listed by chemical group and in alphabetical order within each group. The order does not reflect efficacy.** See Table 3–7. *Activity of Fungicides on Raspberry Diseases and Impact on Honeybees*, page 148 and Table 3–8. *Activity of Insecticides on Raspberry Pests and Impact on Honeybees*, page 150, for efficacy ratings.
- Where a product in the calendar is followed by a “*”, it is potentially acceptable for organic use based on *Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec publication Bulletin D'Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with your certifying body to verify the acceptability of any product prior to using it.

Resistance Management

To delay development of resistance to fungicides, insecticides and miticides, follow resistance management guidelines outlined in *Resistance Management Strategies*, page 393. The chemical group is indicated in the column before the product name. Products belonging to the same chemical group are grouped together in the calendar. Multi-site (M) fungicides are not prone to resistance and do not have to be rotated. Some products are not classified to mode of action (NC) and the mode of action has not been determined for others (U or UN).

Fungicide resistance management

Take the following steps to avoid rapid development of fungicide resistance:

- Do not reduce rates below those specified on the label.
- Do not use products containing the same chemical group in consecutive applications.
- Use products containing only one chemical family no more than twice per season.
- Use co-formulations or products that must be tank-mixed with another chemical group no more than 3 times per season.
- Use sufficient water to provide thorough coverage.

Insecticide resistance management

Take the following steps to avoid development of insecticide resistance:

- For pests with discrete generations (obliquebanded leafroller), do not use insecticides from the same group for more than one generation. Within a generation, if more than one spray is required, use a product from the same chemical group.
- For pests with rapidly building and overlapping generations (mites, aphids), do not use products containing the same chemical group in consecutive applications.

Bee Toxicity

Some insecticides are toxic to bees and other pollinating insects. Use of insecticides on flowering crops requires careful management to avoid negative effects on pollinators. Some insecticides cannot be applied prior to or during bloom. For others, use extreme caution when applying insecticides to raspberries during bloom—do not apply them while bees are active. Before and after bloom, bees may still be present on flowering cover crops and weeds—do not allow drift of insecticides onto these or other flowering crops. Always follow label precautions regarding avoiding impacts on bees. For more information, see *Bee Poisoning*, page 5, and honeybee toxicity ratings in Table 3–7. *Activity of Fungicides on Raspberry Diseases and Impact on Honeybees*, page 148 and Table 3–8. *Activity of Insecticides on Raspberry Pests and Impact on Honeybees*, page 150.

Buffer Zones

Leave a suitable buffer zone between treatment area and adjacent sensitive areas, such as hedgerows, woodlots and freshwater habitats. Zones may vary depending on the product used, growth stage of the crop and method of application including the use of drift-reducing technology. Check the pesticide label for requirements.

Use Health Canada's online spray drift calculator to modify the buffer zone specified on the label based on weather conditions, category of spray equipment and 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. Unfortunately, this model does not account for carrier volume, travel speed or crop stage.

Observing buffer zones is a legal requirement. A record of the buffer zone modification, if any, must be retained for at least one year from the time of application.

Crop Nutrition

Crop nutrition is important for plant growth and fruit quality on berry crops. Soil testing, plant tissue analysis and visual deficiency symptoms all play an important role in assessing and monitoring the crop's nutritional status. For more information, visit <http://www.omafr.gov.on.ca/english/crops/hort/berry.html> (click on *Soil Management, Fertilizer Use, Crop Nutrition and Cover Crops for Fruit Production*) and see OMAFRA Publication 611, *Soil Fertility Handbook*. For soil testing and plant tissue analysis services, see Appendix E: *Accredited Soil-Testing Laboratories in Ontario*, page 435.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Before planting						
Root knot nematode, Phytophthora root rot, Verticillium wilt	NC	MustGrow *	1,121–2,240 kg/ha	24 hours ¹	—	Suppression only. Apply with a calibrated spreader, in early spring, when soil temperatures are above 10°C, but at least 2 weeks before planting. Incorporate into the upper soil layer to a depth of 10–15 cm, followed by irrigation to ensure the top 10–15 cm of soil is well-moistened.
Primocanes emerge						
Anthracnose, Spur blight	General Comments: • Cane diseases are rarely a problem in primocane-fruiting varieties because old canes are mowed down in spring, removing most inoculum. • If cane diseases are a perennial problem, apply when new canes are 25–30 cm tall and again in 10 days. Continue at 10–14-day intervals until just before first bloom.					
	M	Ferbam 76 WDG	2.5 kg/1,000 L water	12 hours	prebloom	No product specific comments.
	11+27	Tanos 50 DF	840 g/ha	9 days	9 days	Do not tank-mix or make sequential applications with Exirel.
Phytophthora root rot	21	Torrent 400 SC	250 mL/ha	12 hours	90 days	Apply in up to 1,000 L water/ha in early spring but at least 90 days before harvest. Reapply after harvest when conditions favour disease development (high soil moisture and cool temperatures). Apply as a high-volume soil drench. Do not use with a surfactant.
Raspberry sawfly	At the time of printing this publication, there are no products registered for these pests. See Table 3–8. <i>Activity of Insecticides on Raspberry Pests and Impact on Honeybees</i> , page 150, for products that may provide some activity on this pest.					
Obliquebanded leafroller	General Comments: • Leafrollers are not usually a problem in Ontario. Substantial damage can occur without crop loss.					
	3	Capture 240 EC	467 mL/ha	12 hours	3 days	Sequential applications must be at least 30 days apart.
	5	Delegate	200 g/ha	12 hours	1 day	Apply to eggs and small larvae.
		Entrust * or Success	267–364 mL/ha 145–182 mL/ha	when dry	1 day	
	11	Bioprotec CAF * or Dipel 2X DF * or Foray 48 BA	1.4–2.8 L/ha 525–1,125 g/ha 1.4–2.8 L/ha	12 hours	0 days	Product must be consumed to be effective. Spray when and where pests are actively feeding. Make 2 applications 3–7 days apart, when larvae are very small. Death of insect may take several days. Acidify spray mix to below pH 7.0 and apply on cloudy days or in the evening.
	18	Intrepid	500–750 mL/ha	12 hours	3 days	Sequential applications must be at least 30 days apart.

¹ After activation with water in soil. ² General re-entry. ³ Hand labour (e.g., pruning, training, tying). ⁴ Hand harvest. ⁵ Mechanical harvest. ⁶ Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Before planting						
Two-spotted spider mite	General Comments: - Beneficial mites can be introduced to prevent mite build-up. - Thorough spray coverage of the lower leaf surface is required.					
	10	Apollo SC	500 mL/ha	12 hours ² / 10 days ³	15 days	Kills mite eggs and young nymphs. Apply early in the season.
	20	Kanemite 15 SC	2.07 L/ha	12 hours	1 day	This product acts quickly on contact with mites. Apply when monitoring indicates mites are building up, and mostly in the nymph stage.
	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	Suppression only. Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Supra Captan, Maestro or sulphur.
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Supra Captan, Maestro or copper and 30 days of sulphur. Do not apply to wet foliage.
	UN	Acramite 50 WS	851 g/ha	12 hours	1 day	This product acts quickly on contact with mites. Apply when monitoring indicates mites are building up, and mostly in the nymph stage.
Prebloom						
Aphids	3	Pyganic EC 1.4 II *	2.32–4.65 L/ha	12 hours	—	Apply when pests are first observed. Do not wait until plants are heavily infested. Reapply, if needed. For best results, use high rate, adjust spray solution to pH of 5.5–7.0, and apply promptly after mixing. If possible, apply in the early morning or evening hours. Do not use when bees or other beneficials are present.
	4A	Assail 70 WP	56–86 g/ha	12 hours	1 day	Use a 7-day interval between sprays. Under heavy pressure, use the high rate. Maximum 2 applications of Group 4A products per season.
	4D	Sivanto Prime	500–750 mL/ha	12 hours	0 days	Toxic to certain beneficial insects. Where possible, rotate with products outside of Group 4.
	NC	Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Supra Captan, Maestro or copper and 30 days of sulphur. Do not apply to wet foliage.

¹ After activation with water in soil. ² General re-entry. ³ Hand labour (e.g., pruning, training, tying). ⁴ Hand harvest. ⁵ Mechanical harvest. ⁶ Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Prebloom						
Japanese beetle	1A	Sevin XLR	5.25 L/ha	6 days ² / 10 days ^{3,4}	11 days	Apply when adults are active. Reapply at 7–10-day intervals, if needed. Do not apply during bloom.
Rose chafers	At the time of printing this publication, no products were registered for Rose chafers. See Table 3–8. <i>Activity of Insecticides on Raspberry Pests and Impact on Honeybees</i> , page 150, for products that may provide some activity on this pest.					
Leafhoppers	General Comments: - Potato leafhopper can be a problem when nearby hay fields are mowed. New plantings are especially susceptible. Leafhoppers feed on primocane leaves and cause new growth to turn yellow and curl under. - Monitor for small green nymphs on lower leaf surface. Spray when nymphs are present and symptoms are evident. - These products are toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements.					
	1B	Malathion 85 E	880 mL/ha	24 hours	1 day	No product specific comments.
	3	Pyganic EC 1.4 II *	2.32–4.65 L/ha	12 hours	—	Apply when pests are first observed. Do not wait until plants are heavily infested. Reapply, if needed. For best results, use high rate, adjust spray solution to pH of 5.5–7.0, and apply promptly after mixing. If possible, apply in the early morning or evening hours. Do not use when bees or other beneficial insects are present. Also controls aphids.
	4A	Assail 70 WP	56–86 g/ha	12 hours	1 day	Maximum 2 applications of products from Group 4A per season.
Bloom (mid-July to August)						
DO NOT APPLY INSECTICIDES WHILE RASPBERRIES ARE IN BLOOM. SEE BEE POISONING, PAGE 5.						
Botrytis grey mould	General Comments: Bloom is the most important time to control botrytis grey mould. Begin at 5%–10% bloom and if the weather is wet. Reapply at 7–10-day intervals.					
	M	Maestro 80 DF or Supra Captan 80 WDG	2.5 kg/ha	72 hours	2 days	Also control spur blight. Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Exirel or Timorex Gold.
	1	Senator 50 SC	700 mL/1,000 L water	12 hours	1 day	Resistance develops rapidly. Tank-mix with a compatible Group M fungicide.
	2	Rovral WP	2 kg/ha	12 hours	1 day	No product specific comments.
	7	Cantus WDG	560 g/ha	12 hours	0 days	Suppression only (Sercadis). Use once then rotate to a different fungicide group.
		Kenja 400 SC	0.987–1.24 L/ha	12 hours	7 days	
		Sercadis	250–666 mL/ha	12 hours	0 days	
	7+11	Pristine WG	1.3–1.6 kg/ha	when dry ² / 24 hours ^{3,4}	0 days	Use once then rotate to a different fungicide group. Do not tank-mix or make sequential applications with Exirel.
	9	Scala SC	2 L/ha	12 hours	0 days	No product specific comments.
	9+12	Switch 62.5 WG	775–975 g/ha	12 hours	1 day	No product specific comments.
	17	Elevate 50 WDG	1.7 kg/ha	4 hours	1 day	No product specific comments.

¹ After activation with water in soil. ² General re-entry. ³ Hand labour (e.g., pruning, training, tying). ⁴ Hand harvest. ⁵ Mechanical harvest. ⁶ Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Bloom (mid-July to August)						
DO NOT APPLY INSECTICIDES WHILE RASPBERRIES ARE IN BLOOM. SEE BEE POISONING, PAGE 5.						
Botrytis grey mould (cont'd)	44	Serenade OPTI *	1.7–3.3 kg/ha	when dry	0 days	Suppression only. For best results, use multiple applications or in rotation with other products.
	46	Timorex Gold *	1.5–2.0 L/ha	4 hours	2 days	Apply in a high-volume spray to ensure thorough coverage. Do not tank-mix or alternate with captan or sulphur products. See label for precautions on compatibility
Fire blight	24	Kasumin 2L	5.0 L in 1,000 L water/ha	12 hours	1 day	Make the first application at the beginning of bloom and reapply every 3–4 days during bloom when conditions favour disease development. If using lower water volumes, refer to the water volume chart indicated on the label for rate recommendations.
Bloom to green fruit						
Raspberry cane borer	General Comments: • Prune out and remove old canes during the dormant period to reduce populations of larvae inside the cane. • Remove all nearby wild raspberries because these are good hosts for cane borers.					
	28	Altacor	215–285 g/ha	12 hours	3 days	Apply soon after damage first appears.
Aphids, Leafhoppers	General Comments: • Some of these products are toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements.					
	3	Pyganic EC 1.4 II *	2.32–4.65 L/ha	12 hours	—	Apply when pests are first observed. Do not wait until plants are heavily infested. Reapply, if needed. For best results, use high rate, adjust spray solution to pH of 5.5–7.0, and apply promptly after mixing. If possible, apply in the early morning or evening hours. Do not use when bees or other beneficial insects are present.
	4A	Assail 70 WP	56–86 g/ha	12 hours	1 day	Use a 7-day interval between sprays. Under heavy pressure, use high rate. Maximum 2 applications of products from Group 4A per season.
	NC	Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	Aphids only. See comments on this product for Aphids at Prebloom .
Two-spotted spider mite	General Comments: • Beneficial mites can be introduced to prevent mite build-up. • Thorough spray coverage of the lower leaf surface is required.					
	20	Kanemite 15 SC	2.07 L/ha	12 hours	1 day	This product acts quickly on contact with mites. Apply when monitoring indicates mites are building up, and mostly in the nymph stage.
	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	Suppression only. See comments on this product for Two-spotted spider mite at Primocanes emerge .
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	See comments on this product for Two-spotted spider mite at Primocanes emerge .

¹ After activation with water in soil. ² General re-entry. ³ Hand labour (e.g., pruning, training, tying). ⁴ Hand harvest. ⁵ Mechanical harvest. ⁶ Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Bloom to green fruit						
Two-spotted spider mite (cont'd)	U	Acramite 50 WS	851 g/ha	12 hours	1 day	This product acts quickly on contact with mites. Apply when monitoring indicates mites are building up, and mostly in the nymph stage.
Preharvest and harvest						
Spotted wing drosophila	General Comments: - Spotted wing drosophila inserts eggs into ripening fruit. Larvae develop in the fruit and may be present at harvest, contributing to premature breakdown. Fall-bearing raspberries are especially susceptible to this pest. - Weekly insecticides are recommended when fruit is ripening or ripe, and flies are present. Rotate between products from different groups. - Frequent picking, burial of grade-out fruit, and general sanitation are very important to prevent problems. - These products rely on contact in order to control spotted wing drosophila adults. Apply in a high-volume spray to ensure thorough coverage of fruit. - These products are toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements. - Emergency use registration of other products is expected. Check ontario.ca/spottedwing for updates on pest development, registered products and management strategies for control.					
	5	Delegate	315–420 g/ha	12 hours	1 day	Use high rate and shorten intervals between applications under heavy pressure.
		Entrust * or Success	334–440 mL/ha 165–220 mL/ha	when dry	1 day	
	28	Exirel	1.0–1.5 L/ha	12 hours	1 day	Use high rate and shorten intervals between applications under heavy pressure. Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Supra Captan or Maestro. See product label for numerous other tank-mix restrictions.
Botrytis grey mould	Although bloom is the most important time to control botrytis grey mould, preharvest sprays are required if the weather is wet. Use one of the products listed for Botrytis grey mould at Bloom (mid-July to August) .					
Powdery mildew	General Comments: In problem areas, spray when mildew is first observed. Repeat in 7–10 days.					
	1	Senator 50 SC	700 mL/1,000 L water	12 hours	1 day	No product specific comments.
	3	Nova	340 g/ha	12 hours	6 days ⁴ / 1 day ⁵	No product specific comments.
	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	Suppression only. Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Supra Captan, Maestro or sulphur.

¹ After activation with water in soil. ² General re-entry. ³ Hand labour (e.g., pruning, training, tying). ⁴ Hand harvest. ⁵ Mechanical harvest. ⁶ Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Preharvest and harvest						
Powdery mildew (cont'd)	NC	Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	Suppression only. Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Supra Captan, Maestro or copper and 30 days of sulphur. Do not apply to wet foliage.
Postharvest						
Phytophthora root rot	2	Torrent 400 SC	250 mL/ha	12 hours	90 days	Apply in up to 1,000 L water/ha after harvest when conditions favour disease development (high soil moisture and cool temperatures). Apply as a high-volume soil drench. Do not use with a surfactant.
Special sprays						
These pests are not common in fall-bearing raspberries. Spray if and when monitoring indicates the need.						
Yellow rust	General Comments: - There are several different rust diseases on raspberries: late leaf rust, yellow rust and orange rust. Late leaf rust and orange rust are the most common in Ontario, yellow rust is rarely seen. These products are only registered for yellow rust. - Apply in spring at first sign of disease on developing leaves. Reapply 14 days later.					
	3	Bumper 432 EC or Fitness or Jade or Tilt 250 E	300 mL/ha 300 mL/ha 500 mL/ha 500 mL/ha	12 hours 4 hours ⁶ /72 hours ² 72 hours 12 hours	30 days	No product specific comments.
		Nova	175 g/ha	12 hours	6 days ⁴ / 1 day ⁵	No product specific comments.
Brown marmorated stink bug	At time of printing this publication, this pest has not been detected in raspberries but breeding populations are present in Ontario. Check ontario.ca/stinkbug for updates on pest development, registered products and management strategies for control.					
Raspberry crown borer	Prune out old canes close to the ground when plants are dormant. If this pest is a problem, use one of the products listed for Raspberry crown borer under Summer-fruited Raspberries at Postharvest .					
Phytophthora root rot	If this disease is a problem, use one of the products listed for Phytophthora root rot under Summer-fruited Raspberries at Early bud break and Postharvest .					
Septoria leaf spot	7	Sercadis	250–666 mL/ha	12 hours	0 days	Apply at first sign of leaf spot. Raspberry leaf spot can cause severe defoliation on some varieties.

¹ After activation with water in soil. ² General re-entry. ³ Hand labour (e.g., pruning, training, tying). ⁴ Hand harvest. ⁵ Mechanical harvest. ⁶ Re-entry with personal protective equipment. See label for details. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 3–6. Products Used on Raspberries and Blackberries

Use this table as a guide but refer to product label for specific information.

The **preharvest interval** is the number of days between the last spray and first harvest.

The **restricted entry interval** is the minimum interval that must be observed between the application of pesticide and work in the treated crop without protective equipment. If no re-entry period is stated on the label, assume it is 12 hours.

The **maximum applications** is the labelled maximum number or product amount applied for the growing season and may be higher than what is recommended for resistance management or for the preservation of beneficial insects and mites.

Products listed as **potentially organic** may be acceptable for organic use based on *Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec publication Bulletin D'Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with certifying body to verify the acceptability of any product prior to using it.

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Crop Registrations (B = blackberry, R = raspberry)	Potentially Organic
Products used for insect and mite control or suppression								
Acramite 50 WS	27925	bifenazate	UN	1 day	12 hours	1	B, R	—
Admire 240 Flowable	24094	imidacloprid	4A	4 days ¹ / 14 days ²	24 hours	3 ¹ /1 ²	B, R	—
Agri-Mek SC	31607	abamectin	6	postharvest	12 hours	2	B, R	—
Alias 240 SC	28475	imidacloprid	4A	4 days ¹ / 14 days ²	24 hours	3 ¹ /1 ²	B, R	—
Assail 70 WP	27128	acetamiprid	4A	1 day	12 hours	4	B, R	—
Altacor	28981	chlorantraniliprole	28	3 days	12 hours	2/3 ³ (max. 645 g/ha)	B, R	—
Apollo SC	21035	clofentezine	10	15 days	12 hours ⁴ / 10 days ⁵	1	R	—
Bioprotec CAF	26854	<i>Bacillus thuringiensis</i>	11	0 days	12 hours	—	B, R	✓
Capture 240 EC	31396	bifenthrin	3A	3 days	12 hours	2 (max. 934 mL/ha)	R	—
Delegate	28778	spinetoram	5	1 day	12 hours	3	B, R	—
Diazinon 500 E	11889	diazinon	1B	prebloom	12 hours	1	B, R	—
Dipel 2X DF	26508	<i>Bacillus thuringiensis</i>	11	0 days	12 hours	—	B, R	✓
Entrust	30382	spinosad	5	1 day	when dry	3	B, R	✓
Exirel	30895	cyantraniliprole	28	1 day	12 hours	4	B, R	—
Foray 48 BA	24978	<i>Bacillus thuringiensis</i>	11	0 days	12 hours	—	R	—
Intrepid	27786	methoxyfenozide	18	3 days	12 hours	3 (max. 2 L/ha)	B, R	—

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. UN = Mode of action has not been determined. — = Information is not specified on the product label ✓ = Potentially organic. Check with certifying body.

¹ Foliar application. ² Soil application. ³ Maximum 2 applications per year at high rate or 3 applications per year at low rate. ⁴ General re-entry. ⁵ Hand labour (e.g., pruning, training, tying).

⁶ Preharvest interval is 1 day for raspberry or 7 days for blackberry. ⁷ Restricted entry interval is 12 hours for blackberries or 24 hours for raspberries. ⁸ Hand harvest. ⁹ Maximum 6 applications per year with no more than 2 dormant applications. ¹⁰ Re-entry with personal protective equipment. See label for more details. ¹¹ After activation with water in soil. ¹² Mechanical harvest.

Table 3–6. Products Used on Raspberries and Blackberries (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Crop Registrations (B = blackberry, R = raspberry)	Potentially Organic
Products used for insect and mite control or suppression								
Kanemite 15 SC	28641	acequinocyl	20B	1 day	12 hours	2 (max 4.1 L/ha)	B, R	—
Malathion 85 E	8372	malathion	1B	1 day/7 days ⁶	12 hours/24 hours ⁷	2	B, R	—
Movento 240 SC	28953	spirotetramat	23	3 days	12 hours	3 (max. 1.1 L/ha)	B, R	—
Nexter	25135	pyridaben	21	postharvest	24 hours	2	R	—
Purespray Green Spray Oil 13 E	27666	mineral oil	NC	—	12 hours	8	B, R	✓
Pyganic EC 1.4 II	30164	pyrethrins	3	—	12 hours	8	R	✓
Sevin XLR	27876	carbaryl	1A	11 days	6 days ⁴ /10 days ^{5,8}	2	B, R	—
Sivanto Prime	31452	flupyradifurone	4D	0 days	12 hours	max. 2 L/ha	B, R	—
Success	26835	spinosad	5	1 day	when dry	3	B, R	—
Surround WP	27469	kaolin	NC	1 day	12 hours	—	R	✓
Vegol Crop Oil	32408	canola oil	NC	0 days	12 hours	2/4 ⁹	B, R	✓
Vydate L	17995	oxamyl	1A	postharvest	12 hours	1	R	—
Products for disease control or suppression								
Aliette	27688	fosetyl al	33	60 days	when dry	4	B, R	—
Bumper 432 EC	28017	propiconazole	3	30 days	12 hours	2	B, R	—
Cantus WDG	30141	boscalid	7	0 days	12 hours	4	B, R	—
Elevate 50 WDG	25900	fenhexamid	17	1 day	4 hours	4	B, R	—
Ferbam 76 WDG	20136	ferbam	M	prebloom	12 hours	3	B, R	—
Fitness	32639	propiconazole	3	30 days	4 hours ¹⁰ /72 hours ⁴	2	B, R	—
Jade	24030	propiconazole	3	30 days	72 hours	2	B, R	—
Kasumin 2L	30591	kasugamycin	24	1 day	12 hours	4	B, R	—
Kenja 400 SC	31758	isofetamid	7	7 days	12 hours	3	B, R	—
Lime Sulphur	16465	calcium polysulphide	M	¼ inch green	48 hours	—	B, R	—

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. UN = Mode of action has not been determined. — = Information is not specified on the product label ✓ = Potentially organic. Check with certifying body.

¹ Foliar application. ² Soil application. ³ Maximum 2 applications per year at high rate or 3 applications per year at low rate. ⁴ General re-entry. ⁵ Hand labour (e.g., pruning, training, tying).

⁶ Preharvest interval is 1 day for raspberry or 7 days for blackberry. ⁷ Restricted entry interval is 12 hours for blackberries or 24 hours for raspberries. ⁸ Hand harvest. ⁹ Maximum 6 applications per year with no more than 2 dormant applications. ¹⁰ Re-entry with personal protective equipment. See label for more details. ¹¹ After activation with water in soil. ¹² Mechanical harvest.

Table 3–6. Products Used on Raspberries and Blackberries (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Crop Registrations (B = blackberry, R = raspberry)	Potentially Organic
Products for disease control or suppression								
Maestro 80 DF	26408	captan	M	2 days	72 hours	—	B, R	—
MustGrow	30263	oriental mustard seed meal	NC	—	24 hours ¹¹	1	B, R	✓
Nova	22399	myclobutanil	3	1 day ¹² /6 day ⁷	12 hours	3	B, R	—
Phostrol	30449	mono- and di-basic sodium, potassium and ammonium phosphites	33	1 day	12 hours	4	R	—
Pristine WG	27985	boscalid + pyraclostrobin	7+11	0 days	when dry ⁴ / 24 hours ^{5,8}	4	B, R	—
Purespray Green Spray Oil 13 E	27666	mineral oil	NC	—	12 hours	8	B, R	✓
Rampart	30654	mono- and dipotassium salts of phosphorous acid	33	—	4 hours	5	B	—
Ridomil Gold 480 SL	28474	metalaxyl-M and S	4	postharvest	12 hours	—	R	—
Rovral WP	15213	iprodione	2	1 day	12 hours	8	R	—
Scala SC	28011	pyrimethanil	9	0 days	12 hours	2	R	—
Senator 50 SC	32096	thiophanate-methyl	1	1 day	12 hours	max. 3.08 L/ha	R	—
Sercadis	31697	fluxapyroxad	7	0 days	12 hours	3	B, R	—
Serenade OPTI	31666	<i>Bacillus subtilis</i>	44	0 days	when dry	—	B, R	✓
Supra Captan 80 WDG	24613	captan	M	2 days	72 hours	—	B, R	—
Switch 62.5 WG	28189	cyprodinil + fludioxonil	9+12	1 day	12 hours	3	B, R	—
Tanos 50 DF	27435	famoxadone + cymoxanil	11+27	9 days	9 days	3	B, R	—
Torrent 400 SC	30392	cyazofamid	21	90 days	12 hours	2	B, R	—
Tilt 250 E	19346	propiconazole	3	30 days	12 hours	2	B, R	—
Timorex Gold	30910	tea tree oil	46	2 days	4 hours	—	R	✓
Vegol Crop Oil	32408	canola oil	NC	0 days	12 hours	2/4 ⁹	B, R	✓

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. UN = Mode of action has not been determined. — = Information is not specified on the product label. ✓ = Potentially organic. Check with certifying body.

¹ Foliar application. ² Soil application. ³ Maximum 2 applications per year at high rate or 3 applications per year at low rate. ⁴ General re-entry. ⁵ Hand labour (e.g., pruning, training, tying). ⁶ Preharvest interval is 1 day for raspberry or 7 days for blackberry. ⁷ Restricted entry interval is 12 hours for blackberries or 24 hours for raspberries. ⁸ Hand harvest. ⁹ Maximum 6 applications per year with no more than 2 dormant applications. ¹⁰ Re-entry with personal protective equipment. See label for more details. ¹¹ After activation with water in soil. ¹² Mechanical harvest.

Notes on Raspberry Diseases and Insects

In this section:

Table 3–7. *Activity of Fungicides on Raspberry Diseases and Impact on Honeybees, on this page.*

Table 3–8. *Activity of Insecticides on Raspberry Pests and Impact on Honeybees, page 150.*

Table 3–7. Activity of Fungicides on Raspberry Diseases and Impact on Honeybees

Use fungicides only for the disease listed on the product label for the crop. The information provided in this table is intended to assist the grower in choosing the best fungicide for control of pests listed on the product label, while managing resistance and avoiding unnecessary sprays for non-target pests. Efficacy can be affected by rate of the product.

Group	Fungicide	Anthraco- (elinoe)	Spur blight	Cane botrytis	Botrytis grey mould	Raspberry leaf spot	Late leaf rust	Yellow rust	Powdery mildew	Phytophthora root rot	Crown gall	Fire blight	Honeybee Toxicity ¹
M	Ferbam 76 WDG	1 *	1 *	1	NA	—	1 D	1 *	—	0	0	0	NT
M	Lime Sulphur	1	1 *	1	0	1	1 D *	1 *	—	0	0	0	NT
M	Maestro 80 DF	2	2 *	1	2 *	1–2	0	0	—	0	0	0	MT
M	Supra Captan 80 WDG	2	2 *	1	2 *	1–2	0	0	—	0	0	0	MT
1	Senator 50 SC	2	2	1	0–1 R *	2	0	0	2 *	0	0	0	NT
2	Rovral WP	—	—	1	2 *	0	0	0	—	0	0	0	NT
3	Bumper 432 EC	—	—	—	—	—	3	3 *	3	0	0	0	NT
3	Fitness	—	—	—	—	—	3	3 *	3	0	0	0	—
3	Jade	—	—	—	—	—	3	3 *	3	0	0	0	NT
3	Nova	—	—	—	—	—	3	3 *	3 *	0	0	0	NT
3	Tilt 250 E	—	—	—	—	—	3	3 *	3	0	0	0	NT

M = Multi-site fungicides. NC = Not classified by FRAC, or group not indicated on product label.

0 = No control. 1 = Poor to fair control. 2 = Good control, some limitations. 3 = Excellent control, few if any limitations. — = No information is available. * (shaded area) = Disease is listed on the product label for control or suppression. NA = Not used at the timing for this pest. R = Resistance to this pathogen has occurred in some areas. D = Delayed dormant timing.

MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.

NT = Relatively non-toxic to bees.

¹ Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

Table 3–7. Activity of Fungicides on Raspberry Diseases and Impact on Honeybees (cont'd)

Group	Fungicide	Anthraco- nose (elsinoe)	Spur blight	Cane botrytis	Botrytis grey mould	Raspberry leaf spot	Late leaf rust	Yellow rust	Powdery mildew	Phytophthora root rot	Crown gall	Fire blight	Honeybee Toxicity ¹
4	Ridomil Gold 480 SL	0	0	0	0	0	0	0	0	3 *	0	0	NT
7	Cantus WDG	—	0	—	3 *	—	—	—	—	0	0	0	NT
7	Kenja 400 SC	—	—	—	— *	—	—	—	—	—	—	—	NT
7	Sercadis	—	—	—	1 *	3 *	—	—	2	0	0	0	NT
7+11	Pristine WG	3	3	3	3 *	3	3	3	3	0	0	0	NT
9	Scala SC	—	—	—	3 *	—	—	—	—	0	0	0	NT
9+12	Switch 62.5 WG	—	—	3	3 *	—	—	—	1	0	0	0	NT
11+27	Tanos 50 DF	2 *	2 *	1 *	1 *	—	—	—	—	—	—	—	NT
17	Elevate 50 WDG	—	1	3	3 *	0	0	—	—	0	0	0	NT
21	Torrent 400 SC	—	—	—	—	—	—	—	—	— *	—	—	—
24	Kasumin 2L	—	—	—	—	—	—	—	—	—	—	— *	NT
33	Aliette	0	0	0	0	0	0	0	0	2 *	0	—	NT
33	Phostrol	0	0	0	0	0	0	0	0	2 *	0	—	NT
33	Rampart	0	0	0	0	0	0	0	0	—	0	0	NT
44	Serenade OPTI	—	—	—	1 *	—	—	—	2	—	—	—	NT
NC	Purespray Green Spray Oil 13 E	—	0	0	0	0	0	0	1 *	0	0	0	—
NC	Vegol Crop Oil	—	0	0	0	0	0	0	1 *	0	0	0	—

M = Multi-site fungicides. NC = Not classified by FRAC, or group not indicated on product label.

0 = No control. 1 = Poor to fair control. 2 = Good control, some limitations. 3 = Excellent control, few if any limitations. — = No information is available. * (shaded area) = Disease is listed on the product label for control or suppression. NA = Not used at the timing for this pest. R = Resistance to this pathogen has occurred in some areas. D = Delayed dormant timing.

MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.

NT = Relatively non-toxic to bees.

¹ Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

Table 3–8. Activity of Insecticides on Raspberry Pests and Impact on Honeybees

Use products only for pests listed on the product label for the crop. The information provided in this table is based on information from other areas. It is intended to assist the grower in choosing the best insecticide for control of pests listed on the product label, while managing resistance and avoiding unnecessary sprays for non-target pests. Efficacy can be affected by rate of the product.

Group	Insecticide	Aphids	Raspberry sawfly	Raspberry fruitworm (beetle)	Leafrollers	Clipper weevil	Leafhoppers	Spider mites	Inchworms and loopers	Rose chafer	Raspberry cane borer	Raspberry crown borer (larvae)	Japanese beetle (adults)	Spotted wing drosophila (adult)	Honeybee Toxicity ¹
1A	Sevin XLR	2 *	—	1	2 *	—	2 *	0	2	2	1	0	3 *	1	HT
1B	Diazinon 500 E	2	3	3	2	1	1	0	NA	NA	2	3 *	NA	NA	HT
1B	Malathion 85 E	1 *	3	3	2	2 *	2 *	— *	2	2 *	2	NA	2	2	HT
3	Pyganic 1.4 EC II	1 *	—	—	—	—	1 *	0	—	—	—	—	—	1	HT
3A	Capture 240 EC	—	—	—	3 *	—	3	1	3	2	—	3	3	3	HT
4A	Admire 240 Flowable	3 *	—	2	—	2	2 *	0	—	2	2 *	—	2 *	—	HT
4A	Alias 240 SC	3 *	—	2	—	2	2 *	0	—	2	2 *	—	2	—	HT
4A	Assail 70 WP	3 *	—	—	—	—	3 *	0	—	—	—	—	2	1	MT
4D	Sivanto Prime	3 *	—	—	—	—	—	—	—	—	—	—	—	—	MT
5	Delegate	0	—	3	3 *	—	—	0	2	—	—	NA	—	3 *	HT
5	Entrust	—	—	3	3 *	—	—	0	2 *	—	—	NA	—	3 *	HT
5	Success	—	—	3	3 *	—	—	0	2 *	—	—	NA	—	3 *	HT
6	Agri-Mek SC	0	0	0	0	0	—	3 PH *	0	0	0	0	0	0	HT
10	Apollo SC	0	0	0	0	0	0	2 *	0	0	0	0	0	0	NT
11	Bioprotec CAF	0	0	0	2 *	0	0	0	1	0	0	0	0	0	NT

NC = Not classified by IRAC, or group not indicated on product label. UN = Mode of action has not been determined.

0 = No control. 1 = Poor to fair control. 2 = Good control, some limitations. 3 = Excellent control, few if any limitations.

NA = Not used at the timing for this pest. — = No information is available. * (shaded area) = Pest is listed on the product label for control or suppression. PH = Postharvest only.

HT = Highly toxic to bees. Severe losses may be expected if used when bees are present at treatment time or within a few days thereafter.

MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.

NT = Relatively non-toxic to bees.

I = Irritant. White film barrier on plant tissue may act as a repellent to bees when foraging.

¹ Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

² May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

Table 3–8. Activity of Insecticides on Raspberry Pests and Impact on Honeybees (cont'd)

Group	Insecticide	Aphids	Raspberry sawfly	Raspberry fruitworm (beetle)	Leafrollers	Clipper weevil	Leafhoppers	Spider mites	Inchworms and loopers	Rose chafer	Raspberry cane borer	Raspberry crown borer (larvae)	Japanese beetle (adults)	Spotted wing drosophila (adult)	Honeybee Toxicity ¹
11	Dipel 2X DF	0	0	0	2 *	0	0	0	1	0	0	0	0	0	NT
11	Foray 48 BA	0	0	0	2 *	0	0	0	1	0	0	0	0	0	NT
18	Intrepid	0	—	0	3 *	0	0	0	3	0	0	—	0	0	NT
20B	Kanemite 15 SC	0	0	0	0	0	0	3 *	0	0	0	0	0	0	NT
21	Nexter	0	0	0	0	0	0	3 PH *	0	0	0	0	0	0	HT
23	Movento 240 SC	3 *	—	—	—	—	—	—	—	—	—	—	—	1	MT ²
28	Altacor	0	—	—	3	—	—	0	3	—	—	2 *	1	—	NT
28	Exirel	3	—	—	3	—	—	—	—	—	—	—	3 *	3 *	HT
NC	Purespray Green Spray Oil 13 E	1 *	0	0	0	0	0	1 *	0	0	0	0	0	0	—
NC	Surround WP	1	—	—	—	—	2 *	1	—	—	—	0	—	—	I
NC	Vegol Crop Oil	1 *	0	0	0	0	0	1 *	0	0	0	0	0	0	—
UN	Acramite 50 WS	0	0	0	0	0	0	3 *	0	0	0	0	0	0	MT

NC = Not classified by IRAC, or group not indicated on product label. UN = Mode of action has not been determined.

0 = No control. 1 = Poor to fair control. 2 = Good control, some limitations. 3 = Excellent control, few if any limitations.

NA = Not used at the timing for this pest. — = No information is available. * (shaded area) = Pest is listed on the product label for control or suppression. PH = Postharvest only.

HT = Highly toxic to bees. Severe losses may be expected if used when bees are present at treatment time or within a few days thereafter.

MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.

NT = Relatively non-toxic to bees.

I = Irritant. White film barrier on plant tissue may act as a repellent to bees when foraging.

¹ Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

² May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

SASKATOON BERRY CALENDAR

In this section:

- Read the product label and follow all safety precautions. Labels for registered pest control products are available at the Pest Management Regulatory Agency (PMRA) website at <http://pr-rp.hc-sc.gc.ca/ls-re/index-eng.php>.
- Always consult the product label for suggested water volumes. Otherwise, use enough water to ensure thorough spray coverage.
- For preharvest interval, restricted entry interval, and maximum number of applications, see Table 3–9. *Products Used on Saskatoon Berries*, page 161.
- **Products are listed by chemical group and in alphabetical order within each group. The order does not reflect efficacy.**
- Where a product in the calendar is followed by a “*”, it is potentially acceptable for organic use based on *Ministère de l’Agriculture, des Pêcheries et de l’Alimentation du Québec publication Bulletin D’Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with your certifying body to verify the acceptability of any product prior to using it.

Resistance Management

To delay development of resistance to fungicides, insecticides and miticides, follow resistance management guidelines outlined in *Resistance Management Strategies*, page 393. The chemical group is indicated in the column before the product name. Products belonging to the same chemical group are grouped together in the calendar. Multi-site (M) fungicides are not prone to resistance and do not have to be rotated. Some products are not classified to mode of action (NC) and the mode of action has not been determined for others (U or UN).

Fungicide resistance management

Take the following steps to avoid rapid development of fungicide resistance:

- Do not reduce rates below those specified on the label.
- Do not use products containing the same chemical group in consecutive applications.
- Use products containing only one chemical family no more than twice per season.
- Use co-formulations or products that must be tank-mixed with another chemical group no more than 3 times per season.
- Use sufficient water to provide thorough coverage.

Insecticide resistance management

Take the following steps to avoid development of insecticide resistance:

- For pests with discrete generations (obliquebanded leafroller), do not use insecticides from the same group for more than one generation. Within a generation, if more than one spray is required, use a product from the same chemical group.
- For pests with rapidly building and overlapping generations (mites, aphids), do not use products containing the same chemical group in consecutive applications.

Bee Toxicity

Some insecticides are toxic to bees and other pollinating insects. Use of insecticides on flowering crops requires careful management to avoid negative effects on pollinators. Some insecticides cannot be applied prior to or during bloom. For others, use extreme caution when applying insecticides to Saskatoon berries during bloom—do not apply them while bees are active. Before and after bloom, bees may still be present on flowering cover crops and weeds—do not allow drift of insecticides onto these or other flowering crops. Always follow label precautions regarding avoiding impacts on bees. For more information, see *Bee Poisoning*, page 5, and honeybee toxicity ratings in Table 3–9. *Products Used on Saskatoon Berries*, page 161.

Buffer Zones

Leave a suitable buffer zone between treatment area and adjacent sensitive areas, such as hedgerows, woodlots and freshwater habitats. Zones may vary depending on the product used, growth stage of the crop and method of application including the use of drift-reducing technology. Check the pesticide label for requirements.

Use Health Canada's online spray drift calculator to modify the buffer zone specified on the label based on weather conditions, category of spray equipment and 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. Unfortunately, this model does not account for carrier volume, travel speed or crop stage.

Observing buffer zones is a legal requirement. A record of the buffer zone modification, if any, must be retained for at least one year from the time of application.

Crop Nutrition

Crop nutrition is important for plant growth and fruit quality on berry crops. Soil testing, plant tissue analysis and visual deficiency symptoms all play an important role in assessing and monitoring the crop's nutritional status. For more information, visit <http://www.omafra.gov.on.ca/english/crops/hort/berry.html> (click on *Soil Management, Fertilizer Use, Crop Nutrition and Cover Crops for Fruit Production*) and see OMAFRA Publication 611, *Soil Fertility Handbook*. For soil testing and plant tissue analysis services, see Appendix E: *Accredited Soil-Testing Laboratories in Ontario*, page 435.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Early bud break						
Saskatoon bud moth, Fruit tree leafroller	NC	Superior 70 Oil *	20 L/1,000 L water	12 hours	¼-inch green	Apply in a high-volume spray to ensure thorough coverage. Tolerance has not been determined for all varieties. Test a small area first. Do not use oil within 48 hours of freezing temperatures, prior to rain or on heat- or moisture-stressed crop. Do not use within 30 days of sulphur.
Flower bud break						
Obliquebanded leafroller, Winter moth, Fruit tree leafroller, Spanworm	General Comments: Not all products are labelled for all pests. Choose a product based on which type of spring-feeding caterpillar is predominant.					
	5	Entrust * or Success	267–364 mL/ha 145–182 mL/ha	when dry	3 days	Use for obliquebanded leafroller and spanworm.
	11	Bioprotec CAF * or Dipel 2X DF *	1.4–2.8 L/ha 525–1,125 g/ha	12 hours	0 days	Use for most leafrollers. Product must be consumed to be effective. Spray when and where pests are actively feeding. Make 2 applications 3–7 days apart, when larvae are very small. Death of insect may take several days. Acidify spray mix to below pH 7.0 and apply on cloudy days or in the evening.
	18	Intrepid	0.5 L/ha	12 hours	7 days	Use for obliquebanded leafroller and spanworm.
	28	Altacor	215–285 g/ha	12 hours	1 day	Use for leafrollers. Do not tank-mix or make sequential applications of Exirel with certain products such as Group 11 or copper fungicides. See product label for numerous other tank-mix restrictions.
		Exirel	0.5– 1.0 L/ha	12 hours	3 days	
Flower bud break						
Saskatoon-juniper rust	General Comments: - This disease causes yellow spots and swelling on leaves and fruit. - Infections on juniper spread up to 2 km to saskatoons. Prune out rust galls on juniper or remove entire juniper plants to reduce disease pressure. - Spray before symptoms develop.					
	3	Funginex DC	3 L/ha	48 hours	60 days	Apply once between Flower bud break and White tip .
	7+11	Pristine WG	1.6 kg/ha	when dry ¹ /29 days ²	0 days	Do not tank-mix or make sequential applications with Exirel.

¹ General re-entry. ² Hand harvest. ³ Hand pruning and thinning. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Flower bud break						
Entomosporium leaf and berry spot	General Comments: - Angular brown spots develop first on lower leaves, causing yellowing, defoliation and fruit cracking. - Spray before symptoms develop. Apply at Flower bud break and reapply at 10–14-day intervals while disease risk persists.					
	M	Cosavet DF Edge * or Kumulus DF * or Microthiol Disperss *	7.5 kg/ha	24 hours	1 day	Do not apply if temperatures are over 27°C or leaf injury may result. Do not use within 14 days of Purespray Green Spray Oil and 30 days of Vegol Crop Oil or Superior Oil.
	3	Funginex DC	3 L/ha	48 hours	60 days	Apply once between Flower bud break and White tip .
	7+11	Pristine WG	1.6 kg/ha	when dry ¹ /29 days ²	0 days	Do not tank-mix or make sequential applications with Exirel.
	9+12	Switch 62.5 WG	775–975 g/ha	12 hours ¹ / 10 days ^{2,3}	1 day	Suppression only.
White tip						
Saskatoon-juniper rust	General Comments: - This disease causes yellow spots and swellings on leaves and fruit. - Infections on juniper spread up to 2 km to saskatoons. Prune out rust galls on juniper or remove entire juniper plants to reduce disease pressure. - Spray before symptoms develop.					
	3	Bumper 432 EC or Fitness or Jade or Tilt 250 E	300 mL/ha 300 mL/ha 500 mL/ha 500 mL/ha	12 hours	38 days	Apply in a minimum of 200 L water/ha.
	7+11	Pristine WG	1.6 kg/ha	when dry ¹ /29 days ²	0 days	Do not tank-mix or make sequential applications with Exirel.
Entomosporium leaf and berry spot	General Comments: - Angular brown spots develop first on lower leaves, causing yellowing, defoliation and fruit cracking. - Spray before symptoms develop. Apply at Flower bud break and reapply at 10–14-day intervals while disease risk persists.					
	M	Cosavet DF Edge * or Kumulus DF * or Microthiol Disperss *	7.5 kg/ha	24 hours	1 day	Do not apply if temperatures are over 27°C or leaf injury may result. Do not use within 14 days of Purespray Green Spray Oil and 30 days of Vegol Crop Oil or Superior Oil.
	3	Bumper 432 EC or Fitness or Jade or Tilt 250 E	300 mL/ha 300 mL/ha 500 mL/ha 500 mL/ha	12 hours	38 days	Apply in a minimum of 200 L water/ha.
	7+11	Pristine WG	1.6 kg/ha	when dry ¹ /29 days ²	0 days	Do not tank-mix or make sequential applications with Exirel.
	9+12	Switch 62.5 WG	775–975 g/ha	12 hours ¹ / 10 days ^{2,3}	1 day	Suppression only.

¹ General re-entry. ² Hand harvest. ³ Hand pruning and thinning. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Bloom						
Powdery mildew	General Comments: • Apply before disease symptoms develop. Reapply 10 days later, if needed. • Alternate with products outside of Group 3 for entomosporium leaf and berry spot control.					
	3	Nova	113 g/1,000 L water or 340 g/ha	12 hours ¹ /72 hours ^{2,3}	14 days	No product specific comments.
Fire blight	24	Kasumin 2L	5.0 L in 1,000 L water/ha	12 hours	1 day	Make the first application at the beginning of Bloom and reapply every 3–4 days during bloom when conditions favour disease development. If using lower water volumes, refer to the water volume chart indicated on the label for rate recommendations.
Petal fall						
Weevils	28	Exirel	1.0–1.5 L/ha	12 hours	3 days	Apply to foliage to control adult weevils in buds or foliage. Do not tank-mix or make sequential applications of Exirel with certain products such as Group 11 or copper fungicides. See product label for numerous other tank-mix restrictions.
Saskatoon-juniper rust	Use one of the products listed for Saskatoon-juniper rust at White tip .					
Entomosporium leaf and berry spot	Use one of the products listed for Entomosporium leaf and berry spot at White tip .					
Green fruit						
Powdery mildew	General Comments: • Apply before disease symptoms develop. Reapply 10 days later, if needed.					
	3	Nova	113 g/1,000 L water or 340 g/ha	12 hours ¹ /72 hours ^{2,3}	14 days	Alternate with products outside of Group 3 for entomosporium leaf and berry spot control.
	NC	Purespray Green Spray Oil 13 E	10 L/1,000 L water	12 hours	—	Suppression only. Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Supra Captan, Maestro or sulphur.
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	Suppression only. Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Supra Captan, Maestro or copper and 30 days of sulphur. Do not apply to wet foliage.

¹ General re-entry. ² Hand harvest. ³ Hand pruning and thinning. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Green fruit						
Saskatoon-juniper rust	Use one of the products listed for Saskatoon-juniper rust at White tip .					
Entomosporium leaf and berry spot	Use one of the products listed for Entomosporium at White tip .					
Obliquebanded leafroller	General Comments: Apply when eggs are hatching or young larvae are present. Use pheromone traps and spray at peak trap catch.					
	28	Altacor	215–285 g/ha	12 hours	1 day	No product specific comments.
		Exirel	0.5–1.0 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications of Exirel with certain products such as Group 11 or copper fungicides. See product label for numerous other tank-mix restrictions.
Japanese beetle	4A	Admire 240 Flowable	175–230 mL/ha	24 hours	3 days	Do not make a foliar application following soil application of a Group 4A insecticide. Do not apply from bud stage to Bloom or when bees are actively foraging. Maximum 2 applications of products from Group 4A per season.
	28	Altacor	215–285 g/ha	12 hours	1 day	Suppression only.
		Exirel	1.5 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications of Exirel with certain products such as Group 11 or copper fungicides. See product label for numerous other tank-mix restrictions.
Weevils	Use one of the products listed for Weevils at Petal fall .					
After harvest						
Woolly elm aphid, Woolly apple aphid	General Comments: - These aphids feed on plant roots and reduce plant vigour. After harvest, dig up suspect bushes and examine the root systems for waxy white aphid colonies. Young plantings are especially susceptible. - Make 1 application in mid-July to mid-August, after harvest is complete.					
	1	Orthene 75% SP	1.7 g/plant	72 hours	11 months	Application is by soil injection. Mix 0.85 g in 1 L of water and apply 2 L/plant. Inject in 3–5 injection points about 12 in. deep. See product label for special application instructions.
	4A	Admire 240 Flowable or Alias 240 SC	0.125 mL/plant	24 hours	14 days	Suppression only. Apply in 200 L water/ha to the soil at the base of each plant, followed by sufficient water to move the product to the root zone. Maximum 2 applications of products from Group 4A per season.
White grubs (larvae of European chafer and Japanese beetle)	4A	Admire 240 Flowable	1.2 L/ha	24 hours	14 days	Reduction in numbers only. Apply to soil with sufficient water volume to move the product to the root zone. Use prior to egg hatch (shortly after adults are active) to control young larvae. Maximum 2 applications of products from Group 4A per season.

¹ General re-entry. ² Hand harvest. ³ Hand pruning and thinning. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Special sprays These pests are not a common problem on saskatoons. Spray if and when monitoring indicates the need.						
Spotted wing drosophila	General Comments: - Spotted wing drosophila inserts eggs into ripening fruit. Larvae develop in the fruit and may be present at harvest, contributing to premature breakdown. - Weekly insecticides are recommended when fruit is ripening or ripe, and flies are present. Rotate between products from different groups. - Frequent picking, burial of grade-out fruit, and general sanitation are very important to prevent problems. - These products rely on contact in order to control spotted wing drosophila adults. Apply in a high-volume spray to ensure thorough coverage of fruit. - These products are toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements. - Emergency use registration of other products is expected. Check ontario.ca/spottedwing for updates on pest development, registered products and management strategies for control.					
	5	Delegate	315–420 g/ha	12 hours	3 days	Use high rate and shorten intervals between applications under heavy pressure.
		Entrust * or Success	334–440 mL/ha 165–220 mL/ha	when dry	3 days	
	28	Exirel	1.0–1.5 L/ha	12 hours	3 days	Use high rate and shorten intervals between applications under heavy pressure. Do not tank-mix or make sequential applications of Exirel with certain products such as Group 11 or copper fungicides. See product label for numerous other tank-mix restrictions.
Aphids	General Comments: - Aphids are not normally a problem in saskatoon berries. - Apply when aphid populations are high, but not during Bloom. Some of these products are toxic to bees. Refer to label for specific bee toxicity statements. - This spray does not control root-feeding woolly elm or apple aphids.					
	4A	Admire 240 Flowable	175 mL/ha	24 hours	3 days	Do not make a foliar application following soil application of a Group 4A insecticide. Do not apply from bud stage to Bloom or when bees are actively foraging. Maximum 2 applications of products from Group 4A per season.
		Assail 70 WP	56–86 g/ha	12 hours ¹ / 48 hours ³	7 days	
	4D	Sivanto Prime	500–750 mL/ha	12 hours	3 days	Toxic to certain beneficial insects. Where possible, rotate with products outside of Group 4.
	23	Movento 240 SC	220–365 mL/ha	12 hours	7 days	Postbloom only.
	NC	Vegol Crop Oil *	2% v/v in 700– 1,900 L water/ha	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Supra Captan, Maestro or copper and 30 days of sulphur. Do not apply to wet foliage.
Leafhoppers	4A	Admire 240 Flowable	175 mL/ha	24 hours	3 days	Do not make a foliar application following soil application of a Group 4A insecticide. Do not apply from bud stage to Bloom or when bees are actively foraging. Maximum 2 applications of products from Group 4A per season.

¹ General re-entry. ² Hand harvest. ³ Hand pruning and thinning. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Special sprays These pests are not a common problem on saskatoons. Spray if and when monitoring indicates the need.						
Brown marmorated stink bug	General Comments: At time of printing this publication, this pest has not been detected in berry crops, but breeding populations are present in Ontario. Check ontario.ca/stinkbug for updates on pest development, registered products and management strategies.					
	4A	Actara 25 WG	280 g/ha	12 hours	3 days	Suppression only. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements. Maximum 2 applications of products from Group 4A per season.
¹ General re-entry. ² Hand harvest. ³ Hand pruning and thinning. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.						

Table 3–9. Products Used on Saskatoon Berries

Use this table as a guide but refer to product label for specific information.

The **preharvest interval** is the number of days between the last spray and first harvest.

The **restricted entry interval** is the minimum interval that must be observed between application of the pesticide and work in the treated crop without protective equipment. If no re-entry period is stated on the label, assume it is 12 hours.

The **maximum applications** is the labelled maximum number or product amount applied for the growing season and may be higher than what is recommended for resistance management or for the preservation of beneficial insects and mites.

Products listed as **potentially organic** may be acceptable for organic use based on *Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec publication Bulletin D'Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with certifying body to verify the acceptability of any product prior to using it.

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic	Honeybee Toxicity ¹
Products used for insect and mite control or suppression								
Actara 25 WG	28408	thiamethoxam	4A	3 days	12 hours	2	—	HT
Admire 240 Flowable	24094	imidacloprid	4A	3 days ¹ / 14 days ²	24 hours	1 ² /2 ¹	—	HT
Alias 240 SC	28475	imidacloprid	4A	14 days	24 hours	1	—	HT
Altacor	28981	chlorantraniliprole	28	1 day	12 hours	3 (max. 645 g/ha)	—	NT
Assail 70 WP	27128	acetamiprid	4A	7 days	12 hours ³ /48 hours ⁴	4	—	MT
Bioprotec CAF	26854	<i>Bacillus thuringiensis</i>	11	0 days	12 hours	—	✓	NT
Delegate	28778	spinetoram	5	3 days	12 hours	3	—	HT
Dipel 2X DF	26508	<i>Bacillus thuringiensis</i>	11	0 days	12 hours	—	✓	NT
Entrust	30382	spinosad	5	3 days	when dry	3	✓	HT
Exirel	30895	cyantraniliprole	28	3 days	12 hours	4 (max. 4.5 L/ha)	—	HT
Intrepid	27786	methoxyfenozide	18	7 days	12 hours	4 (max. 2 L/ha)	—	NT
Movento 240 SC	28953	spirotetramat	23	7 days	12 hours	max. 1.8 L/ha	—	HT ²
Orthene 75% SP	14225	acephate	1B	11 months	72 hours	1	—	HT
Sivanto Prime	31452	flupyradifurone	4D	3 days	12 hours	2 L/ha	—	MT

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. — = Information is not specified on the product label.

✓ = Potentially organic. Check with certifying body.

¹ Foliar application. ² Soil application. ³ General re-entry. ⁴ Hand pruning and thinning. ⁵ Maximum 6 applications per year with no more than 2 dormant applications. ⁶ Hand harvest.

HT = Highly toxic to bees. Severe losses may be expected if used when bees are present at treatment time or within a few days thereafter.

MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.

NT = Relatively non-toxic to bees.

¹ Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

² May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

Table 3–9. Products Used on Saskatoon Berries (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic	Honeybee Toxicity ¹
Products used for insect and mite control or suppression								
Success	26835	spinosad	5	3 days	when dry	3	—	HT
Superior 70 Oil	9542	mineral oil	NC	¼-inch green	12 hours	1	✓	—
Vegol Crop Oil	32408	canola oil	NC	0 days	12 hours	2/4 ⁵	✓	—
Products used for disease control or suppression								
Bumper 432 EC	28017	propiconazole	3	38 days	12 hours	3	—	NT
Cosavet DF Edge	31869	sulphur	M	1 day	24 hours	8	✓	NT
Fitness	32639	propiconazole	3	38 days	12 hours	3	—	NT
Funginex DC	27686	triforine	3	60 days	48 hours	1	—	NT
Jade	24030	propiconazole	3	38 days	12 hours	3	—	NT
Kasumin 2L	30591	kasugamycin	24	1 day	12 hours	4	—	NT
Kumulus DF	18836	sulphur	M	1 day	24 hours	8	✓	NT
Microthiol Disperss	29487	sulphur	M	1 day	24 hours	8	✓	NT
Nova	22399	myclobutanil	3	14 days	12 hours ³ /72 hours ^{4,6}	3	—	NT
Pristine WG	27985	boscalid + pyraclostrobin	7+11	0 days	when dry ³ /29 days ⁶	4	—	NT
Purespray Green Spray Oil 13 E	27666	mineral oil	NC	—	12 hours	8	✓	—
Switch 62.5 WG	28189	cyprodinil and fludioxonil	9+12	1 day	12 hours ³ /10 days ^{4,6}	3	—	NT
Tilt 250 E	19346	propiconazole	3	38 days	12 hours	3	—	NT
Vegol Crop Oil	32408	canola oil	NC	0 days	12 hours	2/4 ⁵	✓	—

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. — = Information is not specified on the product label.

✓ = Potentially organic. Check with certifying body.

¹ Foliar application. ² Soil application. ³ General re-entry. ⁴ Hand pruning and thinning. ⁵ Maximum 6 applications per year with no more than 2 dormant applications. ⁶ Hand harvest.

HT = Highly toxic to bees. Severe losses may be expected if used when bees are present at treatment time or within a few days thereafter.

MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.

NT = Relatively non-toxic to bees.

¹ Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

² May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

NON-BEARING STRAWBERRY CALENDAR (PLANTING YEAR)

In this section:

- Read the product label and follow all safety precautions. Labels for registered pest control products are available at the Pest Management Regulatory Agency (PMRA) website at <http://pr-rp.hc-sc.gc.ca/ls-re/index-eng.php>.
- Consult the product label for suggested water volumes. Otherwise, use enough water to ensure thorough spray coverage.
- For preharvest interval, restricted entry interval and maximum number of applications, see Table 3–10. *Products Used on Strawberries*, page 200.
- **Products are listed by chemical group and in alphabetical order within each group. The order does not reflect efficacy.** See Table 3–11. *Activity of Fungicides on Strawberry Diseases and Impact on Honeybees*, page 204, and Table 3–12. *Activity of Insecticides and Miticides on Strawberry Pests and Impacts on Honeybees*, page 207, for efficacy ratings.
- Where a product in the calendar is followed by a “*”, it is potentially acceptable for organic use based on *Ministère de l’Agriculture, des Pêcheries et de l’Alimentation du Québec publication Bulletin D’Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with your certifying body to verify the acceptability of any product prior to using it.
- Plant growth regulators (PGRs) are chemicals used to control runner production in strawberries. Information on the timing and rates of application for PGRs can be found in the crop calendar. For additional information, visit <http://www.omafra.gov.on.ca/english/crops/hort/berry.html> and click on *Plant Growth Regulators for Fruit Crops*.

Resistance Management

To delay development of resistance to fungicides, insecticides and miticides, follow resistance management guidelines outlined in *Resistance Management Strategies*, page 393. The chemical group is indicated in the column before the product name. Products belonging to the same chemical group are grouped together in the calendar. Multi-site (M) fungicides are not prone to resistance and do not have to be rotated. Some products are not classified to mode of action (NC) and the mode of action has not been determined for others (U or UN).

Fungicide resistance management

Take the following steps to avoid rapid development of fungicide resistance:

- Do not reduce rates below those specified on the label.
- Do not use products containing the same chemical group in consecutive applications.
- Use products containing only one chemical family no more than twice per season.
- Use co-formulations or products that must be tank-mixed with another chemical group no more than 3 times per season.
- Use sufficient water to provide thorough coverage.

Insecticide resistance management

Take the following steps to avoid development of insecticide resistance:

- For pests with discrete generations, do not use insecticides from the same group for more than one generation. Within a generation, if more than one spray is required, use a product from the same chemical group.
- For pests with rapidly building and overlapping generations (mites, aphids), do not use products containing the same chemical group in consecutive applications.

Buffer Zones

Leave a suitable buffer zone between treatment area and adjacent sensitive areas, such as hedgerows, woodlots and freshwater habitats. Zones may vary depending on the product used, growth stage of the crop and method of application including the use of drift-reducing technology. Check the pesticide label for requirements.

Use Health Canada's online spray drift calculator to modify the buffer zone specified on the label based on weather conditions, category of spray equipment and 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. Unfortunately, this model does not account for carrier volume, travel speed or crop stage.

Observing buffer zones is a legal requirement. A record of the buffer zone modification, if any, must be retained for at least one year from the time of application.

Crop Nutrition

Crop nutrition is important for plant growth and fruit quality on berry crops. Soil testing, plant tissue analysis and visual deficiency symptoms all play an important role in assessing and monitoring the crop's nutritional status. For more information, visit <http://www.omafra.gov.on.ca/english/crops/hort/berry.html> (click on *Soil Management, Fertilizer Use, Crop Nutrition and Cover Crops for Fruit Production*) and see OMAFRA Publication 611, *Soil Fertility Handbook*. For soil testing and plant tissue analysis services, see Appendix E: *Accredited Soil-Testing Laboratories in Ontario*, page 435.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Before planting						
Red stele, Root knot nematode, Root lesion nematode, Verticillium wilt	NC	MustGrow *	1,121–2,240 kg/ha	24 hours ¹	—	Suppression only. Apply with a calibrated spreader, in early spring when soil temperatures are above 10°C, but at least 2 weeks before planting. Incorporate into the upper soil layer to a depth of 10–15 cm, followed by irrigation to ensure the top 10–15 cm of soil are well-moistened.
At planting or shortly after						
Black root rot	General Comments: • Apply in the transplant furrow at planting or as a high-volume application directed at the crown in 1,000–1,500 L water/ha within a week after planting. • Mount the spray nozzle so the spray is directed over the plants as a 15–20-cm wide band. • For drench application, use 10 L water per 100 m and irrigate afterwards to ensure adequate movement of the product to the roots. • These products are also registered for application through drip irrigation systems. See label for details.					
	11	Quadris Flowable	1.1 L/ha or 6 mL/100 m of row	12 hours	1 day	Suppression only. Can cause severe injury to certain apple varieties. Do not spray where spray drift may reach apple trees. Do not tank-mix or make sequential applications with Exirel.
	12	Scholar 230 SC	1.2 L/ha or 6.5 mL/100 m of row	12 hours	1 day	Suppression only.
Vegetative growth modification	NC	Apogee	450 g/1,000 L water	12 hours	21 days	Apply prior to beginning of runner initiation after desired field density has been reached. Reapply at 14–21-day intervals. Tank-mix with a non-ionic surfactant at a rate of 50 mL/100 L water and equal amount of ammonium sulphate by weight. See Table 3–15. <i>Adjuvants Used in Ontario</i> , page 211. Do not tank-mix with calcium sprays. This is a new tool for Ontario. Test on a small scale to evaluate effectiveness on different varieties and production systems. For more information, visit http://www.omafra.gov.on.ca/english/crops/hort/berry.htm and click on <i>Plant Growth Regulators for Fruit Crops</i> .
May or early June (when new growth begins after transplanting)						
Strawberry aphids	General Comments: • Control aphids to reduce spread of virus diseases to new fields. • Apply when growth begins after planting. • Some of these products are highly toxic to bees exposed to direct treatment or to residues on blooming crops and weeds. Do not apply when bees are active. Spray before buds open or after deblossoming. Read the specific bee toxicity statements on the label.					
	1	Cygon 480-AG or Lagon 480 E	2.25 L/ha	48 hours	7 days	Apply as a foliar spray.

¹ After activation with water in soil. ² General re-entry. ³ Training, pinching, hand pruning and hand harvest. ⁴ Scouting, weeding, irrigation and mulching.

— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
May or early June (when new growth begins after transplanting)						
Strawberry aphids (cont'd)	4A	Admire 240 Flowable	0.85–1.3 L/ha	24 hours	30 days	Use 7.5–12 mL/100 m of row in 2,000 L/ha of water as a surface band directly to the plant row. Rate depends on row spacing. See label for conversions. Do not use both soil and foliar applications of Group 4A insecticides in the same year. Maximum 2 applications of products from Group 4A per season.
		Assail 70 WP	56–86 g/ha	12 hours	1 day	Apply as a foliar spray. Use a 7-day interval between applications. Use high rate under high pest pressure.
	4D	Sivanto Prime	500–750 mL/ha	12 hours	0 days	Use high rate and shorten intervals between applications under high pest pressure. Toxic to certain beneficial insects. Where possible, rotate with products outside of Group 4.
	28	Exirel	0.5–1.5 L/ha	12 hours	1 day	Use high rate and shorten intervals between applications under high pest pressure. Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Supra Captan, Maestro, Folpan, Bravo or Echo. See product label for numerous other tank-mix restrictions.
	29	Beleaf 50 SG	120–160 g/ha	12 hours	0 days	Safe on beneficial insects and bees.
	NC	Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Supra Captan, Maestro, Folpan or copper and 30 days of sulphur. Do not apply to wet foliage.
Leafrollers	General Comments: • Apply only if leafrollers are easy to find.					
	1B	Malathion 85 E	975 mL/ha	12 hours	3 days	No product specific comments.
	5	Entrust * or Success	267–364 mL/ha 145–182 mL/ha	when dry	1 day	No product specific comments.
	11	Bioprotec CAF * or Dipel 2X DF *	1.4–2.8 L/ha 525–1,125 g/ha	12 hours	0 days	Product must be consumed to be effective. Spray when and where pests are actively feeding. Make 2 applications 3–7 days apart, when larvae are very small. Death of insect may take several days. Acidify spray mix to below pH 7.0 and apply on cloudy days or in the evening.
	28	Altacor	215–285 g/ha	12 hours	1 day	No product specific comments.

¹ After activation with water in soil. ² General re-entry. ³ Training, pinching, hand pruning and hand harvest. ⁴ Scouting, weeding, irrigation and mulching.

— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
May or early June (when new growth begins after transplanting)						
Strawberry cutworm	General Comments: • Apply if cutworm activity is evident, usually June 1–15. • Do not confuse cutworm damage with deer browsing.					
	1	Pyrinex 480 EC or Warhawk 480 EC	1.2 L/ha	24 hours	20 days	Apply in 2,000 L water/ha.
	28	Altacor	215–285 g/ha	12 hours	1 day	No product specific comments.
Root knot nematode, Root lesion nematode	7	Velum Prime	500 mL/ha	12 hours	0 days	Suppression only. Chemigation into the root-zone through low pressure drip, trickle, micro-sprinkler or equivalent equipment. Minimum of 7-day interval between soil applications. Do not make more than 2 sequential applications of any Group 7 fungicides.
One month after planting and again once or twice at 2-week intervals						
Common leaf spot	General Comments: • Protect new leaves as they unfold and ensure thorough coverage of lower leaf surface. • Spray susceptible varieties such as Jewel, Mira, Kent, Veestar and MicMac.					
	M	Copper 53 W *	3.8 kg/ha	48 hours	2 days	Apply alone in 1,000 L water/ha.
		Maestro 80 DF or Supra Captan 80 WDG	4.25 kg/ha	48 hours	2 days	Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Exirel, Fontelis or Timorex Gold.
	1	Senator 50 SC	700 mL/1,000 L water	12 hours	1 day	Resistance develops rapidly. Tank-mix with a compatible Group M fungicide.
	3	Bumper 432 EC or Fitness or Jade or Tilt 250 E	300 mL/ha 300 mL/ha 500 mL/ha 500 mL/ha	12 hours	1 day	Make 1st application when disease levels are no more than 5%. Apply at 10-day intervals. Do not make more than 2 consecutive applications.
	7+9	Luna Tranquility	1.2 L/ha	12 hours	1 day	Rotate with fungicides from different groups. Reapply prior to wetting periods if needed.
	7+11	Pristine WG	1.3–1.6 kg/ha	when dry ² / 24 hours ³	1 day	Do not tank-mix or make sequential applications with Exirel.
Strawberry aphids	General Comments: • Continue to monitor for aphids and protect new plants when aphids are present. • Remove all bloom and blossom clusters before application, and apply as a foliar spray.					
	1	Cygon 480-AG or Lagon 480 E	2.25 L/ha	48 hours	7 days	Do not apply when bees are actively foraging.
	4A	Admire 240 Flowable	175 mL/ha	24 hours	7 days	Do not use both soil and foliar applications of Group 4A insecticides in the same year. Maximum 2 applications of products from Group 4A per season.
		Assail 70 WP	56–86 g/ha	12 hours	1 day	

¹ After activation with water in soil. ² General re-entry. ³ Training, pinching, hand pruning and hand harvest. ⁴ Scouting, weeding, irrigation and mulching.

— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
One month after planting and again once or twice at 2-week intervals						
Strawberry aphids (cont'd)	4D	Sivanto Prime	500–750 mL/ha	12 hours	0 days	Use high rate and shorten intervals between applications under high pest pressure. Toxic to certain beneficial insects. Where possible, rotate with products outside of Group 4.
	28	Exirel	0.5–1.5 L/ha	12 hours	1 day	Use high rate and shorten intervals between applications under high pest pressure. Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Supra Captan, Maestro, Folpan, Bravo or Echo. See product label for numerous other tank-mix restrictions.
	29	Beleaf 50 SG	120–160 g/ha	12 hours	0 days	Safe on beneficial insects and bees.
	NC	Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	See comments on this product for Strawberry aphids at May or early June (when new growth begins after transplanting) .
July to mid-August						
Potato leafhopper	General Comments: - Potato leafhoppers migrate long distances and often appear when nearby hay fields are mowed. - Check underside of leaves and spray when nymphs are present. Repeated applications may be necessary. - Some of these products are highly toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements.					
	1B	Malathion 85 E	975 mL/ha	12 hours	3 days	No product specific comments.
	4A	Assail 70 WP	56–86 g/ha	12 hours	1 day	Remove all bloom and blossom clusters before application, and apply as a foliar spray. Do not use both soil and foliar applications of Group 4A insecticides in the same year. Maximum 2 applications of products from Group 4A per season.
		Admire 240 Flowable	175 mL/ha	24 hours	7 days	
	NC	Surround WP *	25 kg/ha	12 hours	1 day	Apply at 7–14-day intervals when leafhoppers are first detected by monitoring. Efficacy depends on complete coverage of leaves. For early applications, use 25 kg/ha per 500 L of water. Once a base coat is established, use 12.5 kg/ha per 500 L of water for subsequent sprays. Do not apply during Bloom or when fruit is present. Light to moderate rain will help distribute product. Reapply after heavy rain, strong wind or overhead irrigation. Do not use with anti-foaming agents, spreader/stickers or oil.
Strawberry aphids	Use one of the products listed for Aphids at One month after planting .					
Powdery mildew	General Comments: - Begin applications when conditions favour disease or before the first signs of mildew on foliage. Continue as needed on a 7–14-day interval. - Shorten interval between applications when pest pressure is severe.					
	M	Cueva	5 L in 500 L water/ha	4 hours	1 day	Use a 1% solution v/v in 470–940 L water/ha.
		Fracture	1.5–3.3 L/ha	12 hours	0 days	Suppression only. For best results, use multiple applications or in rotation with other products. Maintain agitation of spray mix. Do not mix with foliar fertilizers.

¹ After activation with water in soil. ² General re-entry. ³ Training, pinching, hand pruning and hand harvest. ⁴ Scouting, weeding, irrigation and mulching.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
July to mid-August						
Powdery mildew (cont'd)	3	Fullback 125 SC	512–1,024 mL/ha	12 hours	8 days	Use with a non-ionic surfactant at a rate of 2.5 L/1,000 L water (0.25% v/v). See Table 3–15. <i>Adjuvants Used in Ontario</i> , page 211.
		Mettle 125 ME	219–365 mL/ha	12 hours	0 days	No product specific comments.
		Nova	340 g/ha	12 hours ^{2,4} / 2 days ³	3 days	No product specific comments.
	7	Fontelis	1.0–1.75 L/ha	12 hours	0 days	Rotate with fungicides from different groups. Begin applications when conditions favour disease development and continue as needed on a 7–10-day interval.
		Sercadis	250–333 mL/ha	12 hours	0 days	Fontelis contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
	7+9	Luna Tranquility	1.2 L/ha	12 hours	1 day	Rotate with fungicides from different groups.
	7+11	Pristine WG	1.6 kg/ha	when dry ² / 24 hours ³	1 day	Do not tank-mix or make sequential applications with Exirel.
	11	Flint	140 g/ha	12 hours	0 days	Do not tank-mix or make sequential applications with Exirel.
	13	Quintec	300–440 mL/ha	12 hours	1 day	No product specific comments.
	44	Double Nickel LC *	5.0–12.5 L/ha	when dry	0 days	Suppression only.
	46	Timorex Gold *	2.0 L/ha	4 hours	2 days	Suppression only. Apply in a high-volume spray to ensure thorough coverage. Do not tank-mix or alternate with captan or sulphur products. See label for precautions on compatibility.
	NC	Actinovate SP *	425 g/ha	1 hour	—	Suppression only. Apply in 1,100 L water/ha. Do not combine with other pesticides (especially bactericides), adjuvants, surfactants or foliar fertilizers.
		Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	Suppression only. Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Bravo, Echo, Supra Captan, Maestro, Folpan, Cygon, Lagon or sulphur.
		Tivano *	16–24 L/ha	when dry	—	Suppression only. Use in 200 L water/ha to obtain an 8%–12% solution. Multiple applications at 7–10-day intervals are required for control. Coverage can be improved by using a non-ionic surfactant. See Table 3–15. <i>Adjuvants Used in Ontario</i> , page 211. Check the label for mixing and application instructions.

¹ After activation with water in soil. ² General re-entry. ³ Training, pinching, hand pruning and hand harvest. ⁴ Scouting, weeding, irrigation and mulching.

— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
July to mid-August						
Powdery mildew (cont'd)	NC	Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	Suppression only. Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply within 48 hours of freezing temperatures, when temperatures are high (30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Supra Captan, Maestro, Folpan, or copper fungicides and 30 days of sulphur. Do not apply to wet foliage.
	P5	Regalia Maxx *	0.125%–0.25% v/v in 500–1,000 L water/ha	when dry	0 days	Suppression only. Use 0.125% (1.25 L in 1,000 L water) in a tank-mix with other powdery mildew fungicides or 0.25% (2.5 L in 1,000 L water) in rotation with other powdery mildew fungicides.
White grubs (larvae of European chafer and Japanese beetle)	4A	Admire 240 Flowable	1.2 L/ha	24 hours	30 days	Reduction in numbers only. Apply just prior to egg hatch (shortly after adults are active) to control young larvae. Apply to soil, before mulch is applied. Do not use both soil and foliar applications of Group 4A insecticides in the same year. Maximum 2 applications of products from Group 4A per season. Highly toxic to bees exposed to direct treatment or to residues on blooming crops and weeds. Refer to label for specific bee toxicity statements.
Common leaf spot	If leaf spot is present, continue fungicide applications at regular intervals, prior to wetting periods. Use one of the products listed for Common leaf spot at One month after planting.					
Mid-August and again once or twice						
Powdery mildew	Use one of the products listed for Powdery mildew at July to mid-August.					
Common leaf spot	This is an important timing for control. If leaf spot is present, or on susceptible varieties, continue fungicide applications at regular intervals, prior to wetting periods. Use one of the products listed for Common leaf spot at One month after planting.					
Black root rot	Use one of the products listed for Black root rot At planting or shortly after.					
Strawberry aphids	This is a critical time for aphid control. Populations tend to build up unnoticed at this time. Check new growth and continue an aphid control program if aphids are present. Use one of the products listed for Strawberry aphids at One month after planting.					
Fall						
Red stele	General Comments: - This disease is sporadic and favoured by wet or compacted soil. See Table 3–13. <i>Strawberry Variety Disease Ratings</i>, page 209, for susceptible varieties. - To reduce the chance of resistance, spray only where Red stele has been observed or a high-risk situation occurs.					
	4A	Ridomil Gold 480 SL	1 L/ha	12 hours	postharvest	Make first application in early September and reapply in late October, no later than October 31. Apply in a high-volume spray (2,500 L/ha) to ensure movement into the root zone.
	3	Aliette	5.6 kg/ha	when dry	30 days	Maximum of 4 applications per season: 2 in spring and 2 in fall. Apply as a foliar spray in spring when plants start active growth. Apply at 30–60-day intervals. Make fall applications when soil conditions favour disease development (e.g., high soil moisture, cool temperatures).

¹ After activation with water in soil. ² General re-entry. ³ Training, pinching, hand pruning and hand harvest. ⁴ Scouting, weeding, irrigation and mulching.

— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

JUNE-BEARING STRAWBERRY CALENDAR (FRUITING YEARS)

In this section:

- Read the product label and follow all safety precautions. 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>.
- Consult the product label for suggested water volumes. Otherwise, use enough water to ensure thorough spray coverage.
- For preharvest interval, restricted entry interval and maximum number of applications, see Table 3–10. *Products Used on Strawberries*, page 200.
- **Products are listed by chemical group and in alphabetical order within each group. The order does not reflect efficacy.** See Table 3–11. *Activity of Fungicides on Strawberry Diseases and Impact on Honeybees*, page 204, and Table 3–12. *Activity of Insecticides and Miticides on Strawberry Pests and Impacts on Honeybees*, page 207, for efficacy ratings.
- Where a product in the calendar is followed by a “*”, it is potentially acceptable for organic use based on *Ministère de l’Agriculture, des Pêcheries et de l’Alimentation du Québec publication Bulletin D’Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with your certifying body to verify the acceptability of any product prior to using it.

Resistance Management

To delay development of resistance to fungicides, insecticides and miticides, follow resistance management guidelines outlined in *Resistance Management Strategies*, page 393. The chemical group is indicated in the column before the product name. Products belonging to the same chemical group are grouped together in the calendar. Multi-site (M) fungicides are not prone to resistance and do not have to be rotated. Some products are not classified to mode of action (NC) and the mode of action has not been determined for others (U or UN).

Fungicide resistance management

Take the following steps to avoid rapid development of fungicide resistance:

- Do not reduce rates below those specified on the label.
- Do not use products containing the same chemical group in consecutive applications.
- Use products containing only one chemical family no more than twice per season.
- Use co-formulations or products that must be tank-mixed with another chemical group no more than 3 times per season.
- Use sufficient water to provide thorough coverage.

Insecticide resistance management

Take the following steps to avoid development of insecticide resistance:

- For pests with discrete generations, do not use insecticides from the same group for more than one generation. Within a generation, if more than one spray is required, use a product from the same chemical group.
- For pests with rapidly building and overlapping generations (mites, aphids), do not use products containing the same chemical group in consecutive applications.

Bee Toxicity

Some insecticides are toxic to bees and other pollinating insects. Use of insecticides on flowering crops requires careful management to avoid negative effects on pollinators. Some insecticides cannot be applied prior to or during bloom. For others, use extreme caution when applying insecticides to strawberries during bloom—do not apply them while bees are active. Before and after bloom, bees may still be present on flowering cover crops and weeds—do not allow drift of insecticides onto these or other flowering crops. Always follow label precautions regarding avoiding impacts on bees. For more information, see *Bee Poisoning*, page 5, and honeybee toxicity ratings in Table 3–11. *Activity of Fungicides on Strawberry Diseases and Impact on Honeybees*, page 204, and Table 3–12. *Activity of Insecticides and Miticides on Strawberry Pests and Impacts on Honeybees*, page 207.

Buffer Zones

Leave a suitable buffer zone between treatment area and adjacent sensitive areas, such as hedgerows, woodlots and freshwater habitats. Zones may vary depending on the product used, growth stage of the crop and method of application including the use of drift-reducing technology. Check the pesticide label for requirements.

Use Health Canada's online spray drift calculator to modify the buffer zone specified on the label based on weather conditions, category of spray equipment and 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. Unfortunately, this model does not account for carrier volume, travel speed or crop stage.

Observing buffer zones is a legal requirement. A record of the buffer zone modification, if any, must be retained for at least one year from the time of application.

Crop Nutrition

Crop nutrition is important for plant growth and fruit quality on berry crops. Soil testing, plant tissue analysis and visual deficiency symptoms all play an important role in assessing and monitoring the crop's nutritional status. For more information, visit <http://www.omafra.gov.on.ca/english/crops/hort/berry.html> (click on *Soil Management, Fertilizer Use, Crop Nutrition and Cover Crops for Fruit Production*) and see OMAFRA Publication 611, *Soil Fertility Handbook*. For soil testing and plant tissue analysis services, see Appendix E: *Accredited Soil-Testing Laboratories in Ontario*, page 435.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
When new growth appears						
Red stele	General Comments: - This disease is sporadic and favoured by wet or compacted soil. See Table 3–13. <i>Strawberry Variety Disease Ratings</i>, page 209, for susceptible varieties. - Spray only where Red stele has been observed or a high-risk situation occurs.					
	33	Aliette	5.6 kg/ha	when dry	30 days	Maximum 4 applications per season: 2 in spring and 2 in fall. Apply in spring when plants start active growth. Apply at 30–60-day intervals. Do not apply within 30 days of harvest or after first bloom.
Root knot nematode, Root lesion nematode	7	Velum Prime	500 mL/ha	12 hours	0 days	Suppression only. Chemigation into the root-zone through low pressure drip, trickle, micro-sprinkler or equivalent equipment. Minimum of 7-day interval between soil applications. Do not make more than 2 sequential applications of any Group 7 fungicides.
Botrytis grey mould	General Comments: - Botrytis is a serious disease for strawberries in Ontario. - Use products that provide excellent control under high disease pressure. See Table 3–11. <i>Activity of Fungicides on Strawberry Diseases and Impact on Honeybees</i>, page 204.					
	M	Bravo ZN or Echo 90 DF	3.5 L/ha 1.9 kg/ha	48 hours	0 days	Reduces disease inoculum and prevents infection of senescent leaves. Reapply 10 days later. Do not use within 10 days of oil. Do not tank-mix or make sequential applications with Exirel.
	NC	Botector *	1 kg in 500–2,000 L water/ha	4 hours	0 days	Suppression only. Reapply as needed on a 7–10-day interval up to harvest. Not compatible with certain fungicides including Flint and Switch. See www.bio-ferm.com for product compatibilities. For products that are not compatible, keep a 3-day interval before and after application. Avoid application when heavy rain is forecast. This is a new product in Ontario and little evidence of its efficacy is available.
Black root rot	11	Quadris Flowable	1.1 L/ha or 6 mL/100 m of row	12 hours	1 day	Suppression only. Apply as a high-volume application directed at the crown in 1,000–1,500 L/ha water. Mount the spray nozzle so the spray is directed over the plants as a 15–20-cm wide band. For drench application, use 10 L of water per 100 m and irrigate afterwards to ensure adequate movement of the product to the roots. These products are also registered for application through drip irrigation systems. See label for details. Quadris can cause severe injury to certain apple varieties. Do not spray where spray drift may reach apple trees. Do not tank-mix or make sequential applications with Exirel.
	12	Scholar 230 SC	1.2 L/ha or 6.5 mL/100 m of row	12 hours	1 day	

¹ General re-entry. ² Training, pinching, hand pruning and hand harvest. ³ Apply postharvest only for larva. ⁴ Scouting, weeding, irrigation and mulching.

— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
When flower buds are visible in the crown						
Cyclamen mite	General Comments: • Apply where cyclamen mite has been a problem in the past. • These tiny mites feed on developing leaves in the plant crown, causing leaf distortion and stunted growth.					
	6	Agri-Mek SC	225 mL/ha	12 hours	3 days	Apply in a high-volume spray to ensure thorough leaf coverage. Apply with a non-ionic surfactants at a rate of 1.0–5.0 L/1,000 L water (0.1%–0.5% v/v). See Table 3–15. <i>Adjuvants Used in Ontario</i> , page 211.
	NC	Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of using Supra Captan, Maestro, Folpan, or copper fungicides and 30 days of sulphur. Do not apply to wet foliage.
Strawberry aphids	General Comments: • Apply when aphid populations start to build but before winged stages develop. • Some of these products are highly toxic to bees exposed to direct treatment or to residues on blooming crops and weeds. Do not apply these products to blooming crops while bees are active. Refer to label for specific bee toxicity statements.					
	1B	Cygon 480 AG or Lagon 480 E	2.25 L/ha	48 hours	7 days	Apply as a foliar spray.
	4A	Admire 240 Flowable or Alias 240 SC	0.85–1.3 L/ha	24 hours	30 days	Apply 7.5–12 mL/100 m of row in 2,000 L/ha of water as surface band directly to the plant row. Ensure sufficient water for incorporation into root zone. Rate depends on row spacing. See label for conversions. Do not use both soil and foliar applications of Group 4A insecticides in the same year. Maximum 2 applications of products from Group 4A per season.
		Assail 70 WP	56–86 g/ha	12 hours	1 day	Use high rate and shorten intervals between applications under high pest pressure. Maximum 2 applications of products from Group 4A per season.
	4D	Sivanto Prime	500–750 mL/ha	12 hours	0 days	Use high rate and shorten intervals between applications under high pest pressure. Toxic to certain beneficial insects. Where possible, rotate with products outside of Group 4.
	28	Exirel	0.5–1.5 L/ha	12 hours	1 day	Use high rate and shorten intervals between applications under high pest pressure. Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Supra Captan, Maestro, Folpan, Bravo or Echo. See product label for numerous other tank-mix restrictions.
	29	Beleaf 50 SG	120–160 g/ha	12 hours	0 days	Safe on beneficial insects and bees.

¹ General re-entry. ² Training, pinching, hand pruning and hand harvest. ³ Apply postharvest only for larva. ⁴ Scouting, weeding, irrigation and mulching.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
When flower buds are visible in the crown						
Strawberry aphids (cont'd)	NC	Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of using Supra Captan, Maestro, Folpan, or copper fungicides and 30 days of sulphur. Do not apply to wet foliage.
Common leaf spot	General Comments: - Protect new leaves as they unfold and ensure thorough coverage of lower leaf surface. - Spray susceptible varieties such as Jewel, Mira, Kent, Veestar and MicMac.					
	M	Copper 53 W *	3.8 kg/ha	48 hours	2 days	Apply alone in 1,000 L water/ha.
		Maestro 80 DF or Supra Captan 80 WDG	4.25 kg/ha	48 hours	2 days	Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Exirel, Fontelis or Timorex Gold.
	1	Senator 50 SC	700 mL/1,000 L water	12 hours	1 day	Resistance develops rapidly. Tank-mix with a compatible Group M fungicide.
	3	Bumper 432 EC or Fitness or Jade or Tilt 250 E	300 mL/ha 300 mL/ha 500 mL/ha 500 mL/ha	12 hours	1 day	Make first application when disease levels are no more than 5%. Reapply at 10-day intervals. Do not make more than 2 consecutive applications.
	7+9	Luna Tranquility	1.2 L/ha	12 hours	1 day	Rotate with fungicides from different groups. Reapply prior to wetting periods if needed.
	7+11	Pristine WG	1.3–1.6 kg/ha	when dry ¹ / 24 hours ²	1 day	Do not tank-mix or make sequential applications with Exirel.
Angular leaf spot	NC	Tivano *	16–24 L/ha	when dry	—	Suppression only. Mix in 200 L water/ha to obtain an 8%–12% solution. Multiple applications at 7–10-day intervals are required. Coverage can be improved by using a non-ionic surfactant. See Table 3–15. <i>Adjuvants Used in Ontario</i> , page 211. Check the label for mixing and application instructions.
As flower buds extend from crown						
Strawberry clipper weevil	General Comments: - Check edges of fields for clipped buds. - Spray when first injury is detected, or wait until threshold is reached (approximately 13 clipped buds per m of row). - Reapply if new injury is detected 7 days later.					
	3	Mako or Up-Cyde 2.5 EC	175 mL/ha 280 mL/ha	12 hours	7 days	No product specific comments.
		Matador 120 EC or Silencer 120 EC	104 mL/ha	24 hours	7 days	No product specific comments.

¹ General re-entry. ² Training, pinching, hand pruning and hand harvest. ³ Apply postharvest only for larva. ⁴ Scouting, weeding, irrigation and mulching.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
As flower buds extend from crown						
Tarnished plant bug (adults)	1B	Cygon 480-AG	2.75 L/ha	48 hours	7 days	These products are very toxic to bees. Do not use during bloom or when bees are active. Refer to label for specific bee toxicity statements.
	4A	Clutch 50 WDG	448 g/ha	12 hours	1 day	
First bloom						
INSECTICIDES MAY BE VERY TOXIC TO BEES. DO NOT SPRAY WHEN BEES ARE ACTIVE. SPRAY IN THE EVENING. SEE BEE POISONING, PAGE 5.						
Strawberry aphids	29	Beleaf 50 SG	120–160 g/ha	12 hours	0 days	Safe on beneficial insects and bees. Will also provide suppression of tarnished plant bug if used at the high rate.
Tarnished plant bugs	General Comments: - Do not spray when bees are active. Refer to label for specific bee toxicity statements. - During bloom and green fruit stage, shake blossom clusters and fruit trusses over a shallow dish. Watch for soft-bodied green insects that move quickly to escape. For thresholds and monitoring details, see ontario.ca/cropipm.					
	3	Decis 5 EC	200 mL/ha	12 hours	14 days	These products also control spittle bug and, except Decis, clipper weevil. Toxic to beneficial insects. Use of these products may lead to mite outbreaks.
		Mako or Up-Cyde 2.5 EC	250 mL/ha 400 mL/ha	12 hours	7 days	
		Matador 120 EC or Silencer 120 EC	104 mL/ha	24 hours	7 days	
	15	Rimon 10 EC	835 mL/ha	12 hours	1 day	Apply when nymphs are still in early instar stages. Reapply 10–14 days later.
	29	Beleaf 50 SG	200 g/ha	12 hours	0 days	Suppression only. Apply when nymphs are in early instar stages and before populations reach high levels. Will stop insect feeding rapidly but it may take several days to see a reduction in numbers. Reapply when new insects are detected.
Botrytis grey mould	General Comments: - Botrytis is a serious disease for strawberries in Ontario. - Apply in a high-volume spray to ensure thorough coverage to keep all flower parts protected with fungicide during bloom. - Typically 2–3 sprays at 7–10-day intervals during bloom will give good control. Shorten spray interval between applications (e.g., 5–7 days) during wet weather. - Use products that product excellent control under high disease pressure. See Table 3–11. <i>Activity of Fungicides on Strawberry Diseases and Impact on Honeybees</i>, page 204.					
	M	Folpan 80 WDG	2.5 kg/ha	24 hours	1 day	No product specific comments.
		Fracture	1.5–3.3 L/ha	when dry	0 days	For best results, use multiple applications or in rotation with other products. Maintain agitation of spray mix. Do not mix with foliar fertilizers.
		Granuflo T	2.25–2.5 kg/ 1,000 L water	24 hours	3 days	Use up to 2,000 L water/ha.
		Maestro 80 DF or Supra Captan 80 WDG	4.25 kg/ha	48 hours	2 days	Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Exirel, Fontelis or Timorex Gold.
	1	Senator 50 SC	700 mL/1,000 L water	12 hours	1 day	Resistance develops rapidly. Tank-mix with a compatible Group M fungicide.

¹ General re-entry. ² Training, pinching, hand pruning and hand harvest. ³ Apply postharvest only for larva. ⁴ Scouting, weeding, irrigation and mulching.

— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
First bloom						
INSECTICIDES MAY BE VERY TOXIC TO BEES. DO NOT SPRAY WHEN BEES ARE ACTIVE. SPRAY IN THE EVENING. SEE BEE POISONING, PAGE 5.						
Botrytis grey mould (cont'd)	2	Rovral WP	2 kg/ha	12 hours	1 day	No product specific comments.
	7	Cantus WDG	560 g/ha	12 hours	0 days	Suppression only (Sercadis). Use once then rotate to a different fungicide group. Fontelis contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
		Fontelis	1.0–1.75 L/ha	12 hours	0 days	
		Kenja 400 SC	0.987–1.24 L/ha	12 hours	0 days	
		Sercadis	500–666 mL/ha	12 hours	0 days	
	7+9	Luna Tranquility	1.2 L/ha	12 hours	1 day	Use once then rotate to a different fungicide group.
	7+11	Pristine	1.3–1.6 kg/ha	when dry ¹ / 24 hours ²	1 day	Use once then rotate to a different fungicide group. Do not tank-mix or make sequential applications with Exirel.
	9	Scala SC	2 L/ha	12 hours	1 day	No product specific comments.
	9+12	Switch 62.5 WG	975 g/ha	12 hours	1 day	No product specific comments.
	11	Intuity	439–877 mL/ha	12 hours	0 days	Apply prior to infection. Use high rate under high disease pressure. Do not make more than 2 sequential applications. Do not tank-mix or make sequential applications with Exirel.
	17	Elevate 50 WDG	1.7 kg/ha	4 hours	1 day	No product specific comments.
	44	Double Nickel LC *	5.0–12.5 L/ha	when dry	0 days	Suppression only. For best results, use multiple applications or in rotation with other products.
		Serenade OPTI *	1.7–3.3 kg/ha	when dry	0 days	Suppression only. For best results, use multiple applications or in rotation with other products.
	46	Timorex Gold *	1.5–2.0 L/ha	4 hours	2 days	Do not tank-mix or alternate with captan or sulphur products. See label for precautions on compatibility.
	NC	Actinovate SP *	425 g/ha	1 hour	—	Suppression only. For best results, use multiple applications or in rotation with other products. Do not combine with other pesticides (especially bactericides), adjuvants, surfactants or foliar fertilizers.
		Botector *	1 kg in 500– 2,000 L water/ha	4 hours	0 days	Suppression only. See comments on this product for Botrytis at When new growth appears.
	P5	Regalia Maxx *	0.25% v/v in 500– 1,000 L water/ha	12 hours	0 days	Suppression only. For best results, use multiple applications or in rotation with other products. Use 0.25% (2.5 L in 1,000 L water) in rotation with other Botrytis fungicides.

¹ General re-entry. ² Training, pinching, hand pruning and hand harvest. ³ Apply postharvest only for larva. ⁴ Scouting, weeding, irrigation and mulching.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
First bloom						
INSECTICIDES MAY BE VERY TOXIC TO BEES. DO NOT SPRAY WHEN BEES ARE ACTIVE. SPRAY IN THE EVENING. SEE BEE POISONING, PAGE 5.						
Anthracnose fruit rot	General Comments: Bloom is the best time to control this disease. Warm wet weather during bloom favours the development of anthracnose fruit rot.					
	7+11	Pristine WG	1.3–1.6 kg/ha	when dry ¹ / 24 hours ²	1 day	Resistance to Group 11 fungicides has been identified in Ontario. Tank-mix with a Group M product. See <i>Managing Resistance to Fungicides</i> , page 394. Do not tank-mix or make sequential applications with Exirel.
	9+12	Switch 62.5 WG	775–975 mL/ha	12 hours	1 day	Maximum 2 sequential applications before rotating to a different fungicide group.
	11	Cabrio EG	1 kg/ha	12 hours	1 day	Resistance to Group 11 fungicides has been identified in Ontario. Tank-mix with a Group M product. See <i>Managing Resistance to Fungicides</i> , page 394. Do not tank-mix or make sequential applications with Exirel.
	NC	Actinovate SP *	425 g/ha	1 hour	—	May reduce symptoms but does not provide control or suppression. Do not combine with other pesticides (especially bactericides), adjuvants, surfactants or foliar fertilizers.
		Botector *	1 kg in 500–2,000 L water/ha	4 hours	0 days	Suppression only. Reapply as needed on a 7–10-day interval up to harvest. Not compatible with certain fungicides including Flint and Switch. See www.bio-ferm.com for product compatibilities. For products that are not compatible, keep a 3-day interval before and after application. Avoid application when heavy rain is forecast. This is a new product in Ontario and little evidence of its efficacy is available.
Leather rot	General Comments: Begin applications at 10% bloom and continue at 7-day intervals if conditions favour disease (heavy rains, standing water, rain-splashed soil, history of damage).					
	33	Confine Extra	4–5 L/ha	when dry	1 day	Suppression only.
		Phostrol	2.9–5.8 L/ha	12 hours	3 days	No product specific comments.
7 to 10 days after first bloom						
Botrytis grey mould	Use one of the products listed for Botrytis at First bloom .					
Anthracnose fruit rot	Use one of the products listed for Anthracnose at First bloom .					
Tarnished plant bugs	This is a critical time for control. Continue to monitor for tarnished plant bug. If thresholds are reached, use one of the products listed for Tarnished plant bug at First bloom .					

¹ General re-entry. ² Training, pinching, hand pruning and hand harvest. ³ Apply postharvest only for larva. ⁴ Scouting, weeding, irrigation and mulching.
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¹ General re-entry. ² Training, pinching, hand pruning and hand harvest. ³ Apply postharvest only for larva. ⁴ Scouting, weeding, irrigation and mulching.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
7 to 10 days after first bloom						
Thrips	General Comments: - Check blossoms and under calyces for small thread-like yellow thrips. Expect more problems where insecticides have not been applied for tarnished plant bug. - If populations are high, reapply at 3–4 day intervals. - These products are toxic to bees exposed to direct treatment, drift or residues on blooming plants. Do not apply during bloom or when bees are active.					
	5	Delegate	280 g/ha	12 hours	1 day	Suppression only.
	28	Exirel	1.0–1.5 L/ha	12 hours	1 day	Suppression only. Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Supra Captan, Maestro, Folpan, Bravo or Echo. See product label for numerous other tank-mix restrictions.
Green fruit						
Leather rot (suppression)	Use one of the products listed for Leather rot at First bloom if conditions are favourable for infection.					
Strawberry aphids	4A	Assail 70 WP	56–86 g/ha	12 hours	1 day	This product will also control or suppress tarnished plant bug when used at the high rate. Maximum 2 applications of products from Group 4A per season. Do not apply when bees are actively foraging.
	4D	Sivanto Prime	500–750 mL/ha	12 hours	0 days	Use high rate and shorten intervals between applications under high pest pressure. Toxic to certain beneficial insects. Where possible, rotate with products outside of Group 4.
	28	Exirel	0.5–1.5 L/ha	12 hours	1 day	Use high rate and shorten intervals between applications under high pest pressure. Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Supra Captan, Maestro, Folpan, Bravo or Echo. See product label for numerous other tank-mix restrictions.
	29	Beleaf 50 SG	120–160 g/ha	12 hours	0 days	Safe on beneficial insects and bees. This product will also control or suppress tarnished plant bug when used at the high rate.
	NC	Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply within 48 hours of freezing temperatures, when temperatures are high (30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Supra Captan, Maestro, Folpan, or copper fungicides and 30 days of sulphur. Do not apply to wet foliage.
Tarnished plant bug (nymphs)	General Comments: - During Bloom and Green fruit, shake blossom clusters and fruit trusses over a shallow dish. Watch for soft-bodied green insects that move quickly to escape. - For thresholds and monitoring details, see ontario.ca/cropipm.					
	3	Decis 5 EC	200 mL/ha	12 hours	14 days	These products also control spittle bug and, except Decis, clipper weevil. Toxic to beneficial insects. These products may lead to mite outbreaks.
		Mako or Up-Cyde 2.5 EC	250 mL/ha 400 mL/ha	12 hours	7 days	
		Matador 120 EC or Silencer 120 EC	104 mL/ha	24 hours	7 days	

¹ General re-entry. ² Training, pinching, hand pruning and hand harvest. ³ Apply postharvest only for larva. ⁴ Scouting, weeding, irrigation and mulching.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Green fruit						
Tarnished plant bug (nymphs) (cont'd)	4A	Assail 70 WP	84–210 g/ha	12 hours	1 day	This is the best timing for Assail. Do not spray when bees are active. Use a 7-day interval between sprays. Use the high rate under high pest pressure. Maximum 2 applications of products from Group 4A per season
	15	Rimon 10 EC	835 mL/ha	12 hours	1 day	This is the best timing for Rimon. Do not spray when bees are active. Apply when nymphs are still in the early instar stages. Reapply 10–14 days later.
	29	Beleaf 50 SG	200 g/ha	12 hours	0 days	Suppression only. Apply when nymphs are in early instar stages and before populations reach high levels. Will stop insect feeding rapidly but it may take several days to see a reduction in numbers. Reapply when new insects are detected.
Two-spotted spider mite	General Comments: • Apply in a high-volume spray to ensure thorough coverage of the underside of leaves. • See Table 3–14. <i>Miticides Registered on Strawberries</i>, page 210, for details on timing. • For resistance management, do not use more than once per season.					
	6	Agri-Mek SC	225 mL/ha	12 hours	3 days	Do not spray when bees are active. Apply with a non-ionic surfactant at a rate of 1.0–5.0 L/1,000 L water (0.1%–0.5% v/v). See Table 3–15. <i>Adjuvants Used in Ontario</i> , page 211.
	10	Apollo SC	500 mL/ha	12 hours	15 days	No product specific comments.
	21	Nexter	600 g/ha	24 hours	10 days	Do not spray when bees are active.
	23	Oberon Flowable	880 mL/ha	12 hours	3 days	No product specific comments.
	25	Nealta	1 L/ha	12 hours	1 day	Active on all life stages. The use of an adjuvant may improve performance.
	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	Suppression only. Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Bravo, Echo, Supra Captan, Maestro, Folpan, Cygon, Lagon or sulphur.
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of using Supra Captan, Maestro, Folpan, or copper fungicides and 30 days of sulphur. Do not apply to wet foliage.

¹ General re-entry. ² Training, pinching, hand pruning and hand harvest. ³ Apply postharvest only for larva. ⁴ Scouting, weeding, irrigation and mulching.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Preharvest						
Botrytis grey mould		Use one of the products listed for Botrytis at First bloom . If sprinkler irrigation is used, water early in the day to allow plants to dry off before nightfall.				
Anthrachnose fruit rot		Warm wet weather favours development of anthracnose. In these conditions, use one of the products listed for Anthracnose at First bloom .				
Spotted wing drosophila		General Comments: • Spotted wing drosophila inserts eggs into ripening fruit. Larvae develop in the fruit and may be present at harvest, contributing to premature breakdown. • Weekly insecticides are recommended when fruit is ripening or ripe, and flies are present. Rotate between products from different groups. • Frequent picking, burial of grade-out fruit, and general sanitation are very important to prevent problems. • These products rely on contact in order to control spotted wing drosophila adults. Apply in a high-volume spray to ensure thorough coverage of fruit. • These products are toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements. • Emergency use registration of other products is expected. Check ontario.ca/spottedwing for updates on pest development, registered products and management strategies for control.				
	5	Delegate	280 g/ha	12 hours	1 day	Use high rate and shorten intervals between applications under heavy pressure.
		Entrust * or Success	334–440 mL/ha 165–220 mL/ha	when dry	1 day	
Slugs	NC	Sluggo Professional *	25 kg/ha	12 hours	—	Apply 50 kg/ha if population is very high. Apply when infestation begins to moist soil. Reapply as bait is consumed or at least every 2 weeks if slugs and snails continue to be a problem. Apply by hand or with granular fertilizer spreaders. Do not place in piles.
Renovation (after mowing to July)						
Cyclamen mite		General Comments: • These tiny mites feed on developing leaves in the plant crown, causing leaf distortion and stunted growth. • High water volumes are needed to contact the new growth in the crown.				
	NC	Vegol Crop Oil *	2% v/v in 700–1,900 L water/ ha	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of using Supra Captan, Maestro, Folpan, or copper fungicides and 30 days of sulphur. Do not apply to wet foliage.

¹ General re-entry. ² Training, pinching, hand pruning and hand harvest. ³ Apply postharvest only for larva. ⁴ Scouting, weeding, irrigation and mulching.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Renovation (after mowing to July)						
Black vine weevil (adults)	General Comments: These products are highly toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements.					
	3	Matador 120 EC or Silencer 120 EC	104 mL/ha	24 hours	7 days	Suppression only. Apply when adults activity begins, but not until after harvest. May be less effective at high temperatures (over 27°C).
	4A	Actara 25 WG	210–280 g/ha	12 hours	72 hours ³	Apply to foliage when adults are present, usually during and after harvest. Do not apply if a soil application of a Group 4A insecticide was applied. Also controls cranberry weevils. Maximum 2 applications of products from Group 4A per season.
Black vine weevil (larvae), Strawberry root weevil (larvae)	4A	Actara 25 WG	560 g/ha	12 hours	72 hours ³	Suppression only. Apply as a soil drench to control root weevil larvae. Do not apply if a Group 4A insecticide was applied to soil or foliage in the current year. Maximum 2 applications of products from Group 4A per season.
New growth after renovation (late July to early August)						
Strawberry aphids	General Comments: - Monitor for aphids and apply to foliage when populations build up again after mowing. - Some of these products are highly toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements.					
	1	Cygon 480-AG or Lagon 480 E	2.25 L/ha	48 hours	7 days	No product specific comments.
	4A	Admire 240 Flowable	175 mL/ha	24 hours	7 days	Also control leafhoppers. Do not make a foliar application following a soil application of a Group 4A insecticide. Maximum 2 applications of products from Group 4A per season.
		Assail 70 WP	56–86 g/ha	12 hours	1 day	
	4D	Sivanto Prime	500–750 mL/ha	12 hours	0 days	Use high rate and shorten intervals between applications under high pest pressure. Toxic to certain beneficial insects. Where possible, rotate with products outside of Group 4.
	28	Exirel	0.5–1.5 L/ha	12 hours	1 day	Use high rate and shorten intervals between applications under high pest pressure. Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Supra Captan, Maestro, Folpan, Bravo or Echo. See product label for numerous other tank-mix restrictions.
	29	Beleaf 50 SG	120–160 g/ha	12 hours	0 days	Safe on beneficial insects and bees.
	NC	Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	See comments on this product for Strawberry aphids at Green fruit .

¹ General re-entry. ² Training, pinching, hand pruning and hand harvest. ³ Apply postharvest only for larva. ⁴ Scouting, weeding, irrigation and mulching.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
New growth after renovation (late July to early August)						
Two-spotted spider mite	General Comments: • Apply in a high-volume spray to ensure thorough coverage of the underside of leaves. • See Table 3–14. <i>Miticides Registered on Strawberries</i>, page 210, for details on timing. • For resistance management, do not use more than once per season.					
	6	Agri-Mek SC	225 mL/ha	12 hours	3 days	Use with a non-ionic surfactant at a rate of 1.0–5.0 L/1,000 L water (0.1%–0.5% v/v). See Table 3–15. <i>Adjuvants Used in Ontario</i> , page 211.
	21	Nexter	600 g/ha	24 hours	10 days	No product specific comments.
	23	Oberon Flowable	880 mL/ha	12 hours	3 days	No product specific comments.
	25	Nealta	1 L/ha	12 hours	1 day	Active on all life stages. The use of an adjuvant may improve performance.
	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	See comments on this product for Two-spotted spider mite at Green fruit .
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	See comments on this product for Two-spotted spider mite at Green fruit .
Powdery mildew	General Comments: • Begin applications when conditions favour disease development or before the first signs of mildew on foliage. Continue as needed on a 7–14-day interval. • Shorten interval between applications when disease pressure is severe.					
	M	Cueva	5 L in 500 L water/ha	4 hours	1 day	Use a 1% solution v/v, in 470–940 L water/ha.
		Fracture	1.5–3.3 L/ha	12 hours	0 days	Suppression only. For best results, use multiple applications or in rotation with other products. Maintain agitation of spray mix. Do not mix with foliar fertilizers.
	3	Fullback 125 SC	512–1,024 mL/ha	12 hours	8 days	Use with a non-ionic surfactant at a rate of 2.5 L/1,000 L water (0.25% v/v). See Table 3–15. <i>Adjuvants Used in Ontario</i> , page 211.
		Mettle 125 ME	219–365 mL/ha	12 hours	0 days	No product specific comments.
		Nova	340 g/ha	12 hours ^{1,4} / 2 days ²	3 days	No product specific comments.
	7	Fontelis	1.0–1.75 L/ha	12 hours	0 days	Rotate with fungicides from different groups. Fontelis contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
		Sercadis	250–333 mL/ha	12 hours	0 days	
	7+9	Luna Tranquility	1.2 L/ha	12 hours	1 day	Rotate with fungicides from different groups.
	7+11	Pristine WG	1.6 kg/ha	when dry ¹ / 24 hours ²	1 day	Rotate with fungicides from different groups. Do not tank-mix or make sequential applications with Exirel.
	11	Flint	140 g/ha	12 hours	0 days	Do not tank-mix or make sequential applications with Exirel.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
New growth after renovation (late July to early August)						
Powdery mildew (cont'd)	13	Quintec	300–440 mL/ha	12 hours	1 day	No product specific comments.
	44	Double Nickel LC *	5.0–12.5 L/ha	when dry	0 days	Suppression only.
	46	Timorex Gold *	2.0 L/ha	4 hours	2 days	Suppression only. Apply in a high-volume spray to ensure thorough coverage. Do not tank-mix or alternate with captan or sulphur products. See label for precautions on compatibility
	NC	Actinovate SP *	425 g/ha	1 hour	—	Suppression only. Do not combine with other pesticides (especially bactericides), adjuvants, surfactants or foliar fertilizers.
		Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	Suppression only. Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Bravo, Echo, Supra Captan, Maestro, Folpan, Cygon, Lagon or sulphur.
		Tivano *	16–24 L/ha	when dry	—	Suppression only. Use in 200 L water/ha to obtain an 8%–12% solution. Multiple applications at 7–10-day intervals are required for control. Coverage can be improved by using a non-ionic surfactant. See Table 3–15. <i>Adjuvants Used in Ontario</i> , page 211. Check the label for mixing and application instructions.
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	Suppression only. Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply within 48 hours of freezing temperatures, when temperatures are high (30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Supra Captan, Maestro, Folpan, or copper fungicides and 30 days of sulphur. Do not apply to wet foliage.
	P5	Regalia Maxx *	0.125%–0.25% v/v in 500–1,000 L water/ha	when dry	0 days	Suppression only. Use 0.125% (1.25 L in 1,000 L water) in a tank-mix with other powdery mildew fungicides or 0.25% (2.5 L in 1,000 L water) in rotation with other powdery mildew fungicides.
White grubs (larvae of European chafer and Japanese beetle)	4A	Admire 240 Flowable	1.2 L/ha	24 hours	30 days	Reduction in numbers only. Apply to soil, before mulch is applied. Apply just prior to egg hatch (shortly after adults are active) to control young larvae. Do not use both soil and foliar applications of Group 4A insecticides in the same year. Maximum 2 applications of products from Group 4A per season. This product is highly toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Mid-August and again once or twice						
Strawberry aphids	This is a critical time for aphid control. Populations tend to build up unnoticed at this time. Check new growth and continue an aphid control program if aphids are present. Use one of the products listed for Aphids at New growth after renovation (late July to early August) . Do not exceed the maximum applications per season for each product.					
Powdery mildew	Use one of the fungicides for Powdery mildew at New growth after renovation .					
Angular leaf spot	NC	Tivano *	16–24 L/ha	when dry	—	Suppression only. Mix in 200 L water/ha to obtain an 8%–12% solution. Multiple applications at 7–10-day intervals are required for control. Coverage can be improved by using a non-ionic surfactant. See Table 3–15. <i>Adjuvants Used in Ontario</i> , page 211. Check the label for mixing and application instructions.
Common leaf spot	General Comments: • Apply in a high-volume spray to ensure thorough coverage of the lower leaf surface. • Spray susceptible varieties such as Jewel, Mira, Kent, Veestar and MicMac.					
	M	Copper 53 W *	3.8 kg/ha	48 hours	2 days	Apply alone in 1,000 L water/ha.
		Maestro 80 DF or Supra Captan 80 WDG	4.25 kg/ha	48 hours	2 days	Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Exirel, Fontelis or Timorex Gold.
	1	Senator 50 SC	700 mL/1,000 L water	12 hours	1 day	Resistance develops rapidly. Tank-mix with a compatible Group M fungicide.
	3	Bumper 432 EC or Fitness or Jade or Tilt 250 E	300 mL/ha 300 mL/ha 500 mL/ha 500 mL/ha	12 hours	1 day	Make first application when disease levels are no more than 5%. Apply at 10-day intervals. Do not make more than 2 consecutive applications.
	7+9	Luna Tranquility	1.2 L/ha	12 hours	1 day	Rotate with fungicides from different groups.
	7+11	Pristine WG	1.3–1.6 kg/ha	when dry ¹ / 24 hours ²	1 day	Rotate with fungicides from different groups. Do not tank-mix or make sequential applications with Exirel.
Black root rot	Use one of the fungicides for Black root rot When new growth appears .					
Fall						
Slugs	NC	Sluggo Professional *	25 kg/ha	12 hours	—	Apply 50 kg/ha if population is very high. Apply to moist soil in late summer and early fall to suppress populations for next spring. Reapply as bait is consumed or at least every 2 weeks if slugs and snails continue to be a problem. Apply by hand or with granular fertilizer spreaders. Do not place in piles.
Botrytis grey mould	M	Bravo ZN or Echo 90 DF	3.5 L/ha 1.9 kg/ha	48 hours	0 days	Control this disease by reducing inoculum. Apply in late October.

¹ General re-entry. ² Training, pinching, hand pruning and hand harvest. ³ Apply postharvest only for larva. ⁴ Scouting, weeding, irrigation and mulching.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Fall						
Red stele	General Comments: - This disease is sporadic and favoured by wet or compacted soil. See Table 3–13. <i>Strawberry Variety Disease Ratings</i>, page 209 for susceptible varieties. - Spray only where Red stele has been observed or a high-risk situation occurs.					
	4	Ridomil Gold 480 SL	1 L/ha	12 hours	post-harvest	Do not apply later than October 31. Apply in sufficient water (2,500 L/ha) to ensure movement into the root zone.
	33	Aliette	5.6 kg/ha	when dry	30 days	Maximum of 4 applications per season: 2 in spring and 2 in fall. Apply at 30–60-day intervals. Make postharvest applications when soil conditions favour disease development (e.g., high soil moisture and cool soil temperatures).

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DAY-NEUTRAL STRAWBERRY CALENDAR

In this section:

- Read the product label and follow all safety precautions. 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>.
- Consult the product label for suggested water volumes. Otherwise, use enough water to ensure thorough spray coverage.
- For preharvest intervals, restricted entry intervals and maximum number of applications, see Table 3–10. *Products Used on Strawberries*, page 200.
- **Products are listed by chemical group and in alphabetical order within each group. The order does not reflect efficacy.** See Table 3–11. *Activity of Fungicides on Strawberry Diseases and Impact on Honeybees*, page 204, and Table 3–12. *Activity of Insecticides and Miticides on Strawberry Pests and Impacts on Honeybees*, page 207, for efficacy ratings.
- Where a product in the calendar is followed by a “*”, it is potentially acceptable for organic use based on *Ministère de l’Agriculture, des Pêcheries et de l’Alimentation du Québec publication Bulletin D’Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with your certifying body to verify the acceptability of any product prior to using it.
- Plant growth regulators (PGRs) are chemicals used to control runner production in strawberries. Information on the timing and rates of application for PGRs can be found in the crop calendar. For additional information, visit <http://www.omafra.gov.on.ca/english/crops/hort/berry.html> and click on *Plant Growth Regulators for Fruit Crops*.

Resistance Management

To delay development of resistance to fungicides, insecticides and miticides, follow resistance management guidelines outlined in *Resistance Management Strategies*, page 393. The chemical group is indicated in the column before the product name. Products belonging to the same chemical group are grouped together in the calendar. Multi-site (M) fungicides are not prone to resistance and do not have to be rotated. Some products are not classified to mode of action (NC) and the mode of action has not been determined for others (U or UN).

Fungicide resistance management

Take the following steps to avoid rapid development of fungicide resistance:

- Do not reduce rates below those specified on the label.
- Do not use products containing the same chemical group in consecutive applications.
- Use products containing only one chemical family no more than twice per season.
- Use co-formulations or products that must be tank-mixed with another chemical group no more than 3 times per season.
- Use sufficient water to provide thorough coverage.

Insecticide resistance management

Take the following steps to avoid development of insecticide resistance:

- For pests with discrete generations, do not use insecticides from the same group for more than one generation. Within a generation, if more than one spray is required, use a product from the same chemical group.
- For pests with rapidly building and overlapping generations (mites, aphids), do not use products containing the same chemical group in consecutive applications.

Bee Toxicity

Some insecticides are toxic to bees and other pollinating insects. Use of insecticides on flowering crops requires careful management to avoid negative effects on pollinators. Some insecticides cannot be applied prior to or during bloom. For others, use extreme caution when applying insecticides to strawberries during bloom—do not apply them while bees are active. Before and after bloom, bees may still be present on flowering cover crops and weeds—do not allow drift of insecticides onto these or other flowering crops. Always follow label precautions regarding avoiding impacts on bees. For more information, see *Bee Poisoning*, page 5, and honeybee toxicity ratings in Table 3–11. *Activity of Fungicides on Strawberry Diseases and Impact on Honeybees*, page 204, and Table 3–12. *Activity of Insecticides and Miticides on Strawberry Pests and Impacts on Honeybees*, page 207.

Buffer Zones

Leave a suitable buffer zone between treatment area and adjacent sensitive areas, such as hedgerows, woodlots and freshwater habitats. Zones may vary depending on the product used, growth stage of the crop and method of application including the use of drift-reducing technology. Check the pesticide label for requirements.

Use Health Canada's online spray drift calculator to modify the buffer zone specified on the label based on weather conditions, category of spray equipment and 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. Unfortunately, this model does not account for carrier volume, travel speed or crop stage.

Observing buffer zones is a legal requirement. A record of the buffer zone modification, if any, must be retained for at least one year from the time of application.

Crop Nutrition

Crop nutrition is important for plant growth and fruit quality on berry crops. Soil testing, plant tissue analysis and visual deficiency symptoms all play an important role in assessing and monitoring the crop's nutritional status. For more information, visit <http://www.omafra.gov.on.ca/english/crops/hort/berry.html> (click on *Soil Management, Fertilizer Use, Crop Nutrition and Cover Crops for Fruit Production*) and see OMAFRA Publication 611, *Soil Fertility Handbook*. For soil testing and plant tissue analysis services, see Appendix E: *Accredited Soil-Testing Laboratories in Ontario*, page 435.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
New growth (early spring) or at planting						
Black root rot	General Comments: • Apply as a high-volume application directed at the crown in 1,000–1,500 L/ha water. • Mount the spray nozzle so the spray is directed over the plants as a 15–20-cm wide band. • For drench application, use 10 L of water per 100 m and irrigate afterwards to ensure adequate movement of the product to the roots. • These products are also registered for application through drip irrigation systems. See label for details.					
	11	Quadris Flowable	1.1 L/ha or 6 mL/100 m of row	12 hours	1 day	Suppression only. Can cause severe injury to certain apple varieties. Do not spray where spray drift may reach apple trees. Do not tank-mix or make sequential applications with Exirel.
	12	Scholar 230 SC	1.2 L/ha or 6.5 mL/100 m of row	12 hours	1 day	Suppression only.
Root knot nematode, Root lesion nematode	7	Velum Prime	500 mL/ha	12 hours	0 days	Suppression only. Chemigation into the root-zone through lowpressure drip, trickle, micro-sprinkler or equivalent equipment. Minimum of 7-day interval between soil applications. Do not make more than 2 sequential applications of any Group 7 fungicides.
Vegetative growth modification	NC	Apogee	450 g/1,000 L water	12 hours	21 days	Apply prior to beginning of runner initiation where runners are not needed to increase plant density. Reapply at 14–21-day intervals. Tank-mix with a non-ionic surfactant at a rate of 50 mL/100 L water and equal amount of ammonium sulphate by weight. See Table 3–15. <i>Adjuvants Used in Ontario</i> , page 211. Do not tank-mix with calcium sprays. This is a new tool for Ontario. Test on a small scale to evaluate effectiveness on different varieties and production systems. For more information, visit http://www.omafra.gov.on.ca/english/crops/hort/berry.html and click on <i>Plant Growth Regulators for Fruit Crops</i> .
When flower buds extend from the crown – late April, early May (established plantings planted previous year)						
Strawberry clipper weevil	General Comments: • Strawberry clipper weevil is rarely a problem in first-year plantings. • Check for clipped buds in overwintered plantings, especially near woods, bush or under floating row covers. • Apply an insecticide when the threshold is reached. For thresholds and monitoring details, see ontario.ca/cropipm.					
	3	Mako or Up-Cyde 2.5 EC	175 mL/ha 280 mL/ha	12 hours	7 days	No product specific comments.

¹ General re-entry. ² Training, pinching, hand pruning and hand harvest. ³ Scouting, weeding, irrigation and mulching. — = Information not applicable or not specified on product label.

* = Potentially organic. Check with certifying body.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
When flower buds extend from the crown – late April, early May (established plantings planted previous year)						
Strawberry clipper weevil (cont'd)	3	Matador 120 EC or Silencer 120 EC	104 mL/ha	24 hours	7 days	No product specific comments.
Strawberry aphids	General Comments: • Apply a foliar spray when aphid populations start to build up, but before winged stages develop. • Some of these products are highly toxic to bees exposed to direct treatment or to residues on blooming crops and weeds. Do not apply when bees are active. Read the specific bee toxicity statements on the label.					
	1	Cygon 480-AG or Lagon 480 E	2.25 L/ha	48 hours	7 days	No product specific comments.
	4A	Admire 240 Flowable or Alias 240 SC	0.85–1.3 L/ha	24 hours	30 days	Apply as a soil drench when new growth begins in spring with sufficient water to ensure incorporation into the root zone. Use 7.5–12 mL/100 m of row in 2,000 L/ha water as a surface band directly to the plant row. Rate depends on row spacing. See label for conversions. Maximum 2 applications of products from Group 4A per season.
		Assail 70 WP	56–86 g/ha	12 hours	1 day	Use a 7-day interval between sprays. Use high rate under high pest pressure. Do not use both soil and foliar applications of Group 4A insecticides in the same year. Maximum 2 applications of products from Group 4A per season.
	4D	Sivanto Prime	500–750 mL/ha	12 hours	0 days	Use high rate and shorten interval between applications under high pest pressure. Toxic to certain beneficial insects. Where possible, rotate with products outside of Group 4.
	28	Exirel	0.5–1.5 L/ha	12 hours	1 day	Use high rate and shorten interval between applications under high pest pressure. Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Supra Captan, Maestro, Folpan, Bravo or Echo. See product label for numerous other tank-mix restrictions.
	29	Beleaf 50 SG	120–160 g/ha	12 hours	0 days	Safe on beneficial insects and bees. May also provide suppression of tarnished plant bug when used at the high rate.
	NC	Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of using Supra Captan, Maestro, Folpan, or copper fungicides and 30 days of sulphur. Do not apply to wet foliage.

¹ General re-entry. ² Training, pinching, hand pruning and hand harvest. ³ Scouting, weeding, irrigation and mulching. — = Information not applicable or not specified on product label.

* = Potentially organic. Check with certifying body.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
When flower buds extend from the crown – late April, early May (established plantings planted previous year)						
Two-spotted spider mite	General Comments: - Occasionally two-spotted spider mites are a problem early in the season, especially where row covers are used. - Overwintering mites are bright orange. Do not spray for this stage. Wait for this generation to lay eggs. - Apply in a high-volume spray to ensure thorough coverage of both upper and lower leaf surfaces. - See Table 3–14. <i>Miticides Registered on Strawberries</i>, page 210, for details on timing.					
	6	Agri-Mek SC	225 mL/ha	12 hours	3 days	Do not spray when bees are active. Use with a non-ionic surfactant at a rate of 1.0–5.0 L/1,000 L water (0.1%–0.5% v/v). See Table 3–15. <i>Adjuvants Used in Ontario</i> , page 211.
	10	Apollo SC	500 mL/ha	12 hours	15 days	No product specific comments.
	23	Oberon Flowable	880 mL/ha	12 hours	3 days	No product specific comments.
	25	Nealta	1 L/ha	12 hours	1 day	Active on all life stages. The use of an adjuvant may improve performance.
	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	Suppression only. Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Bravo, Echo, Supra Captan, Maestro, Folpan, Cygon, Lagon or sulphur.
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of using Supra Captan, Maestro, Folpan, or copper fungicides and 30 days of sulphur. Do not apply to wet foliage.
Tarnished plant bug (adults)	1	Cygon 480-AG	2.75 L/ha	48 hours	7 days	Both products are very toxic to bees. Do not apply during Bloom or when bees are active. Read the specific bee toxicity statements on the label. Maximum 2 applications of products from Group 4A per season.
	4A	Clutch 50 WDG	448 g/ha	12 hours	1 day	
Common leaf spot	General Comments: Protect new leaves as they unfold and ensure thorough coverage of lower leaf surface.					
	M	Copper 53 W *	3.8 kg/ha	48 hours	2 days	Apply alone in 1,000 L water/ha.
		Maestro 80 DF or Supra Captan 80 WDG	4.25 kg/ha	48 hours	2 days	Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Exirel, Fontelis or Timorex Gold.
	1	Senator 50 SC	700 mL/1,000 L water	12 hours	1 day	Resistance develops rapidly. Tank-mix with a compatible Group M fungicide.

¹ General re-entry. ² Training, pinching, hand pruning and hand harvest. ³ Scouting, weeding, irrigation and mulching. — = Information not applicable or not specified on product label.

* = Potentially organic. Check with certifying body.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
When flower buds extend from the crown – late April, early May (established plantings planted previous year)						
Common leaf spot (cont'd)	3	Bumper 432 EC or Fitness or Jade or Tilt 250 E	300 mL/ha 300 mL/ha 500 mL/ha 500 mL/ha	12 hours	1 day	Make first application when disease levels are no more than 5%. Reapply at 10-day intervals. Do not make more than 2 consecutive applications.
	7+9	Luna Tranquility	1.2 L/ha	12 hours	1 day	Rotate with fungicides from different groups. Reapply prior to wetting periods if needed.
	7+11	Pristine WG	1.3–1.6 kg/ha	when dry ¹ / 24 hours ²	1 day	Do not tank-mix or make sequential applications with Exirel.
Bloom						
INSECTICIDES MAY BE VERY TOXIC TO BEES. DO NOT SPRAY WHEN BEES ARE ACTIVE. SPRAY IN THE EVENING. SEE BEE POISONING, PAGE 5.						
Strawberry aphids	29	Beleaf 50 SG	120–160 g/ha	12 hours	0 days	Safe on beneficial insects and bees. May also provide suppression of tarnished plant bug when used at the high rate.
Tarnished plant bug	General Comments: - Shake blossom clusters and fruit trusses over a shallow dish. Watch for soft-bodied green insects that move quickly to escape. For thresholds and monitoring details, see ontario.ca/cropipm. - In established plantings that were overwintered, monitor as soon as row covers are removed (early May) and continue at weekly intervals when bloom and green fruit are present. - In new plantings, remove blossom clusters until plants are well-established (6–8 new leaves). Subsequent bloom in new plantings typically coincides with the second generation of tarnished plant bug (early July). Pressure is high at this time and damage can occur quickly. - Some of these products may be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds. Do not apply when bees are active. Refer to label for specific bee toxicity statements.					
	3	Decis 5 EC	200 mL/ha	12 hours	14 days	These products, except Decis, also control clipper weevil. Toxic to beneficial insects. Products from this group may lead to mite or thrips outbreaks.
		Mako or Up-Cyde 2.5 EC	250 mL/ha 400 mL/ha	12 hours	7 days	
		Matador 120 EC or Silencer 120 EC	104 mL/ha	24 hours	7 days	
	4A	Assail 70 WP	84–210 g/ha	12 hours	1 day	In order to meet restrictions limiting the number of applications, most growers will reserve the use of this product until closer to harvest. Use a 7-day interval between sprays. Works best on small nymphs in early instars. Use high rate under high pest pressure and older nymphs (3rd–5th instar). Maximum 2 applications of products from Group 4A per season.
	15	Rimon 10 EC	835 mL/ha	12 hours	1 day	In order to meet restrictions limiting the number of applications, most growers will reserve the use of this product until closer to harvest. Apply when nymphs are still in the early instar stages. Reapply in 10–14 days.

¹ General re-entry. ² Training, pinching, hand pruning and hand harvest. ³ Scouting, weeding, irrigation and mulching. — = Information not applicable or not specified on product label.
 * = Potentially organic. Check with certifying body.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Bloom						
INSECTICIDES MAY BE VERY TOXIC TO BEES. DO NOT SPRAY WHEN BEES ARE ACTIVE. SPRAY IN THE EVENING. SEE BEE POISONING, PAGE 5.						
Tarnished plant bug (cont'd)	29	Beleaf 50 SG	200 g/ha	12 hours	0 days	Suppression only. Apply when nymphs are in early instar stages and before populations reach high levels. Will stop insect feeding rapidly but it may take several days to see a reduction in numbers. Reapply when new insects are detected.
Botrytis grey mould	General Comments: - Botrytis is a serious disease for strawberries in Ontario. - Apply in a high-volume spray to ensure thorough coverage to keep all flower parts protected with fungicide during bloom. - Typically 2–3 sprays at 7–10-day intervals during bloom will give good control. Shorten spray interval between applications (e.g., 5–7 days) during wet weather. - Use products that product excellent control under high disease pressure. See Table 3–11. <i>Activity of Fungicides on Strawberry Diseases and Impact on Honeybees</i>, page 204.					
	M	Folpan 80 WDG	2.5 kg/ha	24 hours	1 day	No product specific comments.
		Fracture	1.5–3.3 L/ha	12 hours	0 days	Suppression only. For best results, use multiple applications or in rotation with other products. Maintain agitation of spray mix. Do not mix with foliar fertilizers.
		Granuflo T	2.25–2.5 kg/ 1,000 L water	24 hours	3 days	Use up to 2,000 L water/ha.
		Maestro 80 DF or Supra Captan 80 WDG	4.25 kg/ha	48 hours	2 days	No product specific comments.
	1	Senator 50 SC	700 mL/1,000 L water	12 hours	1 day	Resistance develops rapidly. Tank-mix with a compatible Group M fungicide.
	2	Rovral WP	2 kg/ha	12 hours	1 day	No product specific comments.
	7	Cantus WDG	560 g/ha	12 hours	0 days	Suppression only (Sercadis). Use once then rotate to a different fungicide group. Fontelis contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
		Fontelis	1.0–1.75 L/ha	12 hours	0 days	
		Kenja 400 SC	0.987–1.24 L/ha	12 hours	0 days	
		Sercadis	500–666 mL/ha	12 hours	0 days	
	7+9	Luna Tranquility	1.2 L/ha	12 hours	1 day	Use once then rotate to a different fungicide group.
	7+11	Pristine WG	1.3–1.6 kg/ha	when dry ¹ / 24 hours ²	1 day	Use once then rotate to a different fungicide group. Do not tank-mix or make sequential applications with Exirel.
	9	Scala SC	2 L/ha	12 hours	1 day	No product specific comments.
	9+12	Switch 62.5 WG	975 g/ha	12 hours	1 day	No product specific comments.
	11	Intuity	439–877 mL/ha	12 hours	0 days	Apply prior to infection. Use high rate and shorten interval between applications under high disease pressure. Do not make more than 2 sequential applications. Do not tank-mix or make sequential applications with Exirel.

¹ General re-entry. ² Training, pinching, hand pruning and hand harvest. ³ Scouting, weeding, irrigation and mulching. — = Information not applicable or not specified on product label.

* = Potentially organic. Check with certifying body.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Bloom						
INSECTICIDES MAY BE VERY TOXIC TO BEES. DO NOT SPRAY WHEN BEES ARE ACTIVE. SPRAY IN THE EVENING. SEE BEE POISONING, PAGE 5.						
Botrytis grey mould (cont'd)	17	Elevate 50 WDG	1.7 kg/ha	4 hours	1 day	No product specific comments.
	44	Double Nickel LC *	5.0–12.5 L/ha	when dry	0 days	Suppression only. For best results, use multiple applications or in rotation with other products.
		Serenade OPTI *	1.7–3.3 kg/ha	when dry	0 days	Suppression only. For best results, use multiple applications or in rotation with other products.
	46	Timorex Gold *	1.5–2.0 L/ha	4 hours	2 days	Apply in a high-volume spray to ensure thorough coverage. Do not tank-mix or alternate with captan or sulphur products. See label for precautions on compatibility.
	NC	Actinovate SP *	425 g/ha	1 hour	—	Suppression only. For best results, use multiple applications or in rotation with other products. Do not combine with other pesticides (especially bactericides), adjuvants, surfactants or foliar fertilizers.
		Botector *	1 kg in 500–2,000 L water/ha	4 hours	0 days	Suppression only. Reapply as needed on a 7–10-day interval up to harvest. Not compatible with certain fungicides including Flint and Switch. See www.bio-ferm.com for product compatibilities. For products that are not compatible, keep a 3-day interval before and after application. Avoid application when heavy rain is forecast. This is a new product in Ontario and little evidence of its efficacy is available.
	P5	Regalia Maxx *	0.25% v/v in 500–1,000 L water/ha	when dry	0 days	Suppression only. For best results, use multiple applications or in rotation with other products. Use 0.25% (2.5 L in 1,000 L water) in rotation with other Botrytis fungicides.
Anthracnose fruit rot	General Comments: • Warm, wet weather during bloom favours disease development.					
	7+11	Pristine WG	1.3–1.6 kg/ha	when dry ¹ / 24 hours ²	1 day	Resistance to Group 11 fungicides has been identified in Ontario. Tank-mix with a Group M product. See <i>Managing Resistance to Fungicides</i> , page 394. Do not tank-mix or make sequential applications with Exirel.
	9+12	Switch 62.5 WG	775–975 mL/ha	12 hours	1 day	Maximum 2 sequential applications before rotating to a different fungicide group.
	11	Cabrio EG	1 kg/ha	12 hours	1 day	Resistance to Group 11 fungicides has been identified In Ontario. Tank-mix with a Group M product. See <i>Managing Resistance to Fungicides</i> , page 394. Do not tank-mix or make sequential applications with Exirel.

¹ General re-entry. ² Training, pinching, hand pruning and hand harvest. ³ Scouting, weeding, irrigation and mulching. — = Information not applicable or not specified on product label.

* = Potentially organic. Check with certifying body.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Bloom						
INSECTICIDES MAY BE VERY TOXIC TO BEES. DO NOT SPRAY WHEN BEES ARE ACTIVE. SPRAY IN THE EVENING. SEE BEE POISONING, PAGE 5.						
Anthracnose fruit rot (cont'd)	NC	Actinovate SP *	425 g/ha	1 hour	—	May reduce symptoms but does not provide control or suppression. Do not combine with other pesticides (especially bactericides), adjuvants, surfactants or foliar fertilizers.
		Botector *	1 kg in 500–2,000 L water/ha	4 hours	0 days	Suppression only. Reapply as needed on a 7–10-day interval up to harvest. Not compatible with certain fungicides including Flint and Switch. See www.bio-ferm.com for product compatibilities. For products that are not compatible, keep a 3-day interval before and after application. Avoid application when heavy rain is forecast. This is a new product in Ontario and little evidence of its efficacy is available.
Angular leaf spot	NC	Tivano *	16–24 L/ha	when dry	—	Suppression only. Mix in 200 L water/ha to obtain an 8%–12% solution. Multiple applications at 7–10-day intervals are required for control. Coverage can be improved by using a non-ionic surfactant. See Table 3–15. <i>Adjuvants Used in Ontario</i> , page 211. Check the label for mixing and application instructions.
Powdery mildew	General Comments:					
	• Begin applications when conditions favour disease or before the first signs of mildew on foliage. Continue as needed on a 7–14-day interval. • Shorten interval between applications when disease pressure is severe.					
	M	Cueva	5 L in 500 L water/ha	4 hours	1 day	Use 1% v/v in 470–940 L water/ha.
		Fracture	1.5–3.3 L/ha	12 hours	0 days	Suppression only. For best results, use multiple applications or in rotation with other products. Maintain agitation of spray mix. Do not mix with foliar fertilizers.
	3	Fullback 125 SC	512–1,024 mL/ha	12 hours	8 days	Use with a non-ionic surfactant at a rate of 2.5 L/1,000 L water (0.25% v/v). See Table 3–15. <i>Adjuvants Used in Ontario</i> , page 211.
		Mettle 125 ME	219–365 mL/ha	12 hours	0 days	No product specific comments.
		Nova	340 g/ha	12 hours ^{1,3} / 2 days ²	3 days	No product specific comments.
	7	Fontelis	1.0–1.75 L/ha	12 hours	0 days	Rotate with fungicides from different groups. Begin applications when conditions favour disease development. Continue as needed on a 7–10-day interval.
		Sercadis	250–333 mL/ha	12 hours	0 days	Fontelis contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
	7+9	Luna Tranquility	1.2 L/ha	12 hours	1 day	Rotate with fungicides from different groups.
	7+11	Pristine WG	1.6 kg/ha	when dry ¹ / 24 hours ²	1 day	Rotate with fungicides from different groups. Do not tank-mix or make sequential applications with Exirel.

¹ General re-entry. ² Training, pinching, hand pruning and hand harvest. ³ Scouting, weeding, irrigation and mulching. — = Information not applicable or not specified on product label.

* = Potentially organic. Check with certifying body.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Bloom						
INSECTICIDES MAY BE VERY TOXIC TO BEES. DO NOT SPRAY WHEN BEES ARE ACTIVE. SPRAY IN THE EVENING. SEE BEE POISONING, PAGE 5.						
Powdery mildew (cont'd)	11	Flint	140 g/ha	12 hours	0 days	Do not tank-mix or make sequential applications with Exirel.
	13	Quintec	300–440 mL/ha	12 hours	1 day	No product specific comments.
	44	Double Nickel LC *	5.0–12.5 L/ha	when dry	0 days	Suppression only.
	46	Timorex Gold *	2.0 L/ha	4 hours	2 days	Suppression only. Apply in a high-volume spray to ensure thorough coverage. Do not tank-mix or alternate with captan or sulphur products. See label for precautions on compatibility
	NC	Actinovate SP *	425 g/ha	1 hour	—	Suppression only. Do not combine with other pesticides (especially bactericides), adjuvants, surfactants or foliar fertilizers.
		Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	Suppression only. Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply oil within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Bravo, Echo, Supra Captan, Maestro, Folpan, Cygon, Lagon or sulphur.
		Tivano *	16–24 L/ha	when dry	—	Suppression only. Use in 200 L water/ha to obtain an 8%–12% solution. Multiple applications at 7–10-day intervals are required for control. Coverage can be improved by using a non-ionic surfactant. See Table 3–15. <i>Adjuvants Used in Ontario</i> , page 211. Check the label for mixing and application instructions.
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	Suppression only. Apply in a high-volume spray to ensure thorough coverage. Summer oils can cause crop injury. Tolerance has not been determined for all varieties. Test a small area first. Do not apply within 48 hours of freezing temperatures, when temperatures are high (30°C), prior to rain or to heat- or moisture-stressed crop. Do not use within 14 days of Supra Captan, Maestro, Folpan, or copper fungicides and 30 days of sulphur. Do not apply to wet foliage. Avoid application during bloom.
	P5	Regalia Maxx *	0.125–0.25% v/v in 500–1,000 L water/ha	when dry	0 days	Suppression only. Use 0.125% (1.25 L in 1,000 L water) in a tank-mix with other powdery mildew fungicides or 0.25% (2.5 L in 1,000 L water) in rotation with other powdery mildew fungicides.

¹ General re-entry. ² Training, pinching, hand pruning and hand harvest. ³ Scouting, weeding, irrigation and mulching.

* = Potentially organic. Check with certifying body.

— = Information not applicable or not specified on product label.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Bloom and green fruit						
Two-spotted spider mite	General Comments: • Apply in a high-volume spray to ensure thorough coverage of the underside of leaves. • See Table 3–14. <i>Miticides Registered on Strawberries</i>, page 210, for details on timing. • For resistance management, do not use more than once per season.					
	6	Agri-Mek SC	225 mL/ha	12 hours	3 days	Do not spray when bees are active. Use with a non-ionic surfactant at a rate of 1.0–5.0 L/1,000 L water (0.1%–0.5% v/v). See Table 3–15. <i>Adjuvants Used in Ontario</i> , page 211.
	10	Apollo SC	500 mL/ha	12 hours	15 days	No product specific comments.
	21	Nexter	600 g/ha	24 hours	10 days	Do not spray when bees are active.
	23	Oberon Flowable	880 mL/ha	12 hours	3 days	No product specific comments.
	25	Nealta	1 L/ha	12 hours	1 day	Active on all life stages. The use of an adjuvant may improve performance.
	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	Suppression only. See comments on this product for Two-spotted spider mite at When flower buds extend .
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	See comments on this product for Two-spotted spider mite at When flower buds extend . Avoid application during bloom.
Tarnished plant bug	Continue to monitor for tarnished plant bug. If thresholds are reached, use one of the products listed for Tarnished plant bug at Bloom , but check the preharvest interval. Late May and early July are periods of peak activity, but populations vary due to the use of row covers, crop management, weed species in the field, nearby alfalfa and clover crops, and insecticides applied for other pests. Weekly monitoring is important.					
Bloom, green fruit and harvest (June, July, August)						
Strawberry aphids	General Comments: • Apply a foliar spray when aphid populations start to build up, but before winged stages develop. • Some of these products are highly toxic to bees exposed to direct treatment or to residues on blooming crops and weeds. Do not apply when bees are active. Read the specific bee toxicity statements on the label.					
	4D	Sivanto Prime	500–750 mL/ha	12 hours	0 days	Use high rate and shorten interval between applications under high pest pressure. Toxic to certain beneficial insects. Where possible, rotate to products outside of Group 4.
	28	Exirel	0.5–1.5 L/ha	12 hours	1 day	Use high rate and shorten interval between applications under high pest pressure. Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Supra Captan, Maestro, Folpan, Bravo or Echo. See product label for numerous other tank-mix restrictions.
	29	Beleaf 50 SG	120–160 g/ha	12 hours	0 days	Safe on beneficial insects and bees. May also provide suppression of tarnished plant bug when used at the high rate.

¹ General re-entry. ² Training, pinching, hand pruning and hand harvest. ³ Scouting, weeding, irrigation and mulching. — = Information not applicable or not specified on product label.

* = Potentially organic. Check with certifying body.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Bloom, green fruit and harvest (June, July, August)						
Spotted wing drosophila	General Comments: - Spotted wing drosophila inserts eggs into ripening fruit. Larvae develop in the fruit and may be present at harvest, contributing to premature breakdown. - Weekly insecticides are recommended when fruit is ripening or ripe and flies are present. Rotate between products from different groups. - Frequent picking, burial of grade-out fruit and general sanitation are very important to prevent problems. - These products rely on contact in order to control spotted wing drosophila adults. Apply in a high-volume spray to ensure thorough coverage of fruit. - These products are toxic to bees exposed to direct treatment or residues on blooming crops and weeds. Refer to label for specific bee toxicity statements. - Emergency use registration of other products is expected. Check ontario.ca/spottedwing for updates on pest development, registered products and management strategies for control.					
	5	Delegate	280 g/ha	12 hours	1 day	Use high rate and shorten intervals between applications under heavy pressure.
		Entrust * or Success	292–364 mL/ha 145–182 mL/ha	when dry	1 day	
Tarnished plant bugs	General Comments: - These products have short preharvest intervals and can be used during harvest. - Shake blossom clusters and fruit trusses over a shallow dish. Watch for soft-bodied green insects that move quickly to escape. For thresholds and monitoring details, see ontario.ca/cropipm. - Some of these products may be toxic to bees exposed to direct treatment or residues on flowering crops and weeds. Do not apply when bees are active. Refer to label for specific bee toxicity statements.					
	4A	Assail 70 WP	84–210 g/ha	12 hours	1 day	Use a 7-day interval between sprays. Works best on small nymphs in early instars. Use high rate under high pest pressure and older nymphs (3rd–5th instar). Maximum 2 applications of products from Group 4A per season
	15	Rimon 10 EC	835 mL/ha	12 hours	1 day	Apply when nymphs are in the early instar stages. Reapply in 10–14 days.
	29	Beleaf 50 SG	200 g/ha	12 hours	0 days	Suppression only. Apply when nymphs are in early instar stages and before populations reach high levels. Will stop insect feeding rapidly but it may take several days to see a reduction in numbers. Reapply when new insects are detected.
Thrips	General Comments: - Check blossoms and under calyces for small thread-like yellow thrips. - These products are highly toxic to bee exposed to direct treatment, drift or residues on flowering crops or weeds. Do not apply when bees are active. Refer to label for specific bee toxicity statements.					
	5	Delegate	280 g/ha	12 hours	1 day	Suppression only. Shorten interval between applications under high pest pressure.
	28	Exirel	1.0–1.5 L/ha	12 hours	1 day	Suppression only. Use high rate and shorten interval between applications under high pest pressure. Do not tank-mix or make sequential applications with Group 11 fungicides, copper fungicides, Supra Captan, Maestro, Folpan, Bravo or Echo. See product label for numerous other tank-mix restrictions.

¹ General re-entry. ² Training, pinching, hand pruning and hand harvest. ³ Scouting, weeding, irrigation and mulching. — = Information not applicable or not specified on product label.

* = Potentially organic. Check with certifying body.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Bloom, green fruit and harvest (June, July, August)						
Two-spotted spider mite	General Comments: • Apply in a high-volume spray to ensure thorough coverage of the underside of leaves. • See Table 3–14. <i>Miticides Registered on Strawberries</i>, page 210, for details on timing. • For resistance management, do not use more than once per season.					
	23	Oberon Flowable	880 mL/ha	12 hours	3 days	No product specific comments.
	25	Nealta	1 L/ha	12 hours	1 day	Active on all life stages. The use of an adjuvant may improve performance.
	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	Suppression only. See comments on this product for Two-spotted spider mite at When flower buds extend .
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	See comments on this product for Two-spotted spider mite at When flower buds extend . Avoid application during bloom.
Potato leafhopper	General Comments: • Check leaf edges for yellowing and check the lower leaf surface for small, rapidly moving bright green nymphs. • Potato leafhoppers have many hosts and often build up in strawberry fields after the first few cuts of local hay. • Albion is especially susceptible to leafhoppers.					
	1	Malathion 85 E	975 mL/ha	12 hours	3 days	No product specific comments.
	4A	Assail 70 WP	56–86 g/ha	12 hours	1 day	Use a 7-day interval between sprays. Use high rate under high pest pressure. Maximum 2 applications of products from Group 4A per season.
Angular leaf spot (suppression)	Use one of the products listed for Angular leaf spot at Bloom .					
Botrytis grey mould	Use one of the products listed for Botrytis at Bloom .					
Common leaf spot	Use one of the products listed for Common leaf spot When flower buds extend from the crown .					
Anthracnose fruit rot	Use one of the products listed for Anthracnose at Bloom .					
Powdery mildew	This is an important time for mildew control. Use one of the products listed for Powdery mildew at Bloom .					
Bloom, green fruit and harvest (September)						
Spotted wing drosophila	Use one of the products listed for Spotted wing drosophila at Bloom, Green fruit and harvest (June, July, August) .					
Tarnished plant bug	Continue to monitor for tarnished plant bug. If thresholds are reached in early September, use one of the products listed for Tarnished plant bug at Bloom, Green fruit and harvest (June, July, August) .					

¹ General re-entry. ² Training, pinching, hand pruning and hand harvest. ³ Scouting, weeding, irrigation and mulching. — = Information not applicable or not specified on product label.

* = Potentially organic. Check with certifying body.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Bloom, green fruit and harvest (September)						
Slugs	NC	Sluggo Professional *	25 kg/ha	12 hours	—	Apply 50 kg/ha if population is very high. Apply to moist soil. Reapply as bait is consumed or at least every 2 weeks if slugs and snails continue to be a problem. Apply by hand or with granular fertilizer spreaders. Do not place in piles.
Angular leaf spot	Use one of the products listed for Angular leaf spot at Bloom .					
Botrytis grey mould	Use one of the products listed for Botrytis at Bloom .					
Powdery mildew	This is an important time for mildew control. Use one of the products listed for Powdery mildew at Bloom .					
Black root rot	Use one of the products listed for Black root rot at New growth (early spring) .					
¹ General re-entry. ² Training, pinching, hand pruning and hand harvest. ³ Scouting, weeding, irrigation and mulching. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.						

Table 3–10. Products Used on Strawberries

Use this as a guide but refer to product label for specific information.

The **preharvest interval** is the number of days between the last spray and first harvest.

The **restricted entry interval** is the minimum interval that must be observed between application of the pesticide and work in the treated crop without protective equipment. If no re-entry period is stated on the label, assume it is 12 hours.

The **maximum applications** is the labelled maximum number or product amount applied for the growing season and may be higher than what is recommended for resistance management or for the preservation of beneficial insects and mites.

Products listed as **potentially organic** may be acceptable for organic use based on *Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec publication Bulletin D'Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with certifying body to verify the acceptability of any product prior to using it.

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
Products used for insect and mite control or suppression							
Actara 25 WG	28408	thiamethoxam	4A	3 days ¹	12 hours	2 ² /1 ³	—
Admire 240 Flowable	24094	imidacloprid	4A	7 days ⁴ /30 days ⁵	24 hours	2 ⁴ /1 ⁵	—
Agri-Mek SC	31607	abamectin	6	3 days	12 hours	2	—
Alias 240 SC	28475	imidacloprid	4A	30 days	24 hours	1 ⁵	—
Altacor	28981	chlorantraniliprole	28	1 day	12 hours	3 (max. 645 g/ha)	—

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Plant extract.

— = Information is not specified on the product label. ✓ = Potentially organic. Check with certifying body.

¹ Apply postharvest only for larva. ² Preharvest application. ³ Postharvest application. ⁴ Foliar application. ⁵ Soil application. ⁶ Maximum 6 applications per year with no more than 2 dormant applications. ⁷ Maximum 2 applications for botrytis per year or 4 L/ha for powdery mildew per year. ⁸ After activation with water in soil. ⁹ Scouting, weeding, irrigation and mulching.

¹⁰ General re-entry. ¹¹ Training, pinching, hand pruning and hand harvest. ¹² Maximum 2 applications per year for maximum 2 years (maximum 4 applications per crop).

Table 3–10. Products Used on Strawberries (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
Products used for insect and mite control or suppression							
Apollo SC	21035	clofentezine	10	15 days	12 hours	1	—
Assail 70 WP	27128	acetamiprid	4A	1 day	12 hours	2	—
Beleaf 50 SG	29796	flonicamid	29	0 days	12 hours	3	—
Bioprotec CAF	26854	<i>Bacillus thuringiensis</i>	11	0 days	12 hours	—	✓
Clutch 50 WDG	29382	clothianidin	4A	1 day	12 hours	1	—
Cygon 480-AG	25651	dimethoate	1B	7 days	48 hours	2	—
Decis 5 EC	22478	deltamethrin	3	14 days	12 hours	2	—
Delegate	28778	spinetoram	5	1 day	12 hours	3	—
Dipel 2X DF	26508	<i>Bacillus thuringiensis</i>	11	0 days	12 hours	—	✓
Entrust	30382	spinosad	5	1 day	when dry	3	✓
Exirel	30895	cyantraniliprole	28	1 day	12 hours	4	—
Lagon 480 E	9382	dimethoate	1B	7 days	48 hours	2	—
Mako	30316	cypermethrin	3	7 days	12 hours	3	—
Malathion 85 E	8372	malathion	1B	3 days	12 hours	2	—
Matador 120 EC	24984	lambda-cyhalothrin	3	7 days	24 hours	3	—
Nealta	31284	cyflumetofen	25	1 day	12 hours	2	—
Nexter	25135	pyridaben	21	10 days	24 hours	2	—
Oberon Flowable	28905	spiromesifen	23	3 days	12 hours	3	—
Purespray Green Spray Oil 13 E	27666	mineral oil	NC	—	12 hours	8	✓
Pyrinex 480 EC	23705	chlorpyrifos	1B	20 days	24 hours	1	—
Rimon 10 EC	28881	novaluron	15	1 day	12 hours	3	—
Silencer 120 EC	29052	lambda-cyhalothrin	3	7 days	24 hours	3	—
Sivanto Prime	31452	flupyradifurone	4D	0 days	12 hours	max. 2 L/ha	—
Sluggo Professional	30025	ferric phosphate	NC	—	12 hours	—	✓
Success	26835	spinosad	5	1 day	when dry	3	—
Surround WP	27469	kaolin	NC	1 day	12 hours	—	✓
Up-Cyde 2.5 EC	28795	cypermethrin	3	7 days	12 hours	3	—
Vegol Crop Oil	32408	canola oil	NC	0 days	12 hours	2/4 ⁶	✓
Warhawk 480 EC	29984	chlorpyrifos	1B	20 days	24 hours	1	—

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¹ Apply postharvest only for larva. ² Preharvest application. ³ Postharvest application. ⁴ Foliar application. ⁵ Soil application. ⁶ Maximum 6 applications per year with no more than 2 dormant applications. ⁷ Maximum 2 applications for botrytis per year or 4 L/ha for powdery mildew per year. ⁸ After activation with water in soil. ⁹ Scouting, weeding, irrigation and mulching.

¹⁰ General re-entry. ¹¹ Training, pinching, hand pruning and hand harvest. ¹² Maximum 2 applications per year for maximum 2 years (maximum 4 applications per crop).

Table 3–10. Products Used on Strawberries (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
Products used for disease control or suppression							
Actinovate SP	28672	<i>Streptomyces lydicus</i>	NC	—	1 hour	—	✓
Aliette	27688	fosetyl al	33	30 days	when dry	4	—
Botector	31248	<i>Aureobasidium pullulans</i>	NC	0 days	4 hours	6	✓
Bravo ZN	28900	chlorothalonil	M	30 days	48 hours	3	—
Bumper 432 EC	28017	propiconazole	3	1 day	12 hours	4	—
Cabrio EG	27323	pyraclostrobin	11	1 day	12 hours	5	—
Cantus WDG	30141	boscalid	7	0 days	12 hours	5	—
Supra Captan 80 WDG	24613	captan	M	2 days	48 hours	—	—
Confine Extra	30648	phosphorous acid, mono- and di-potassium salts of phosphorus acid	33	1 day	when dry	5	—
Copper 53 W	9934	tri-basic copper sulphate	M	2 days	48 hours	5	✓
Cueva	31825	copper octanoate	M	1 day	4 hours	3	—
Double Nickel LC	31887	<i>Bacillus amyloliquefaciens</i>	44	0 days	when dry	—	✓
Echo 90 DF	29356	chlorothalonil	M	30 days	48 hours	3	—
Elevate 50 WDG	25900	fenhexamid	17	1 day	4 hours	4	—
Fitness	32639	propiconazole	3	1 day	12 hours	4	—
Flint	30619	trifloxystrobin	11	0 days	12 hours	3	—
Folpan 80 WDG	27733	folpet	M	1 day	24 hours	6	—
Fontelis	30331	penthiopyrad	7	0 days	12 hours	3 (max. 5.25 L/ha)	—
Fracture	32139	BLAD polypeptide	M	0 days	12 hours	5	—
Fullback 125 SC	31679	flutriafol	3	8 days	12 hours	max. 2.05 L/ha	—
Granuflo T	30548	thiram	M	3 days	24 hours	5	—
Intuity	32288	mandestrobin	11	0 days	12 hours	max. 3.51 L/ha	—
Jade	24030	propiconazole	3	1 day	12 hours	4	—
Kenja 400 SC	31758	isofetamid	7	0 days	12 hours	5	—
Luna Tranquility	30510	fluopyram + pyrimethanil	7+9	1 day	12 hours	2/max. 4 L/ha ⁷	—

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¹⁰ General re-entry. ¹¹ Training, pinching, hand pruning and hand harvest. ¹² Maximum 2 applications per year for maximum 2 years (maximum 4 applications per crop).

Table 3–10. Products Used on Strawberries (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
Products used for disease control or suppression							
Maestro 80 DF	26408	captan	M	2 days	48 hours	—	—
Mettle 125 ME	30673	tetraconazole	3	0 days	12 hours	4	—
MustGrow	30263	oriental mustard seed meal	NC	—	24 hours ⁸	1	✓
Nova	22399	myclobutanil	3	3 days	12 hours ^{9,10} / 2 days ¹¹	6	—
Phostrol	30449	mono and dibasic sodium, potassium and ammonium phosphites	33	3 days	12 hours	4	—
Pristine WG	27985	boscalid + pyraclostrobin	7+11	1 day	when dry ¹⁰ / 24 hours ¹¹	5	—
Purespray Green Spray Oil 13 E	27666	mineral oil	NC	—	12 hours	8	✓
Quadris Flowable	26153	azoxystrobin	11	1 day	12 hours	2	—
Quintec	29755	quinoxifen	13	1 day	12 hours	4	—
Regalia Maxx	30199	extract of <i>Reynoutria sachalinensis</i>	P5	0 days	when dry	—	✓
Ridomil Gold 480 SL	28474	metalaxyl-M and S	4	postharvest	12 hours	2	—
Rovral WP	15213	iprodione	2	1 day	12 hours	—	—
Scala SC	28011	pyrimethanil	9	1 day	12 hours	3	—
Scholar 230 SC	29528	fludioxonil	12	1 day	12 hours	2 ¹² (max 2.4 L/ha)	—
Senator 50 SC	32096	thiophanate-methyl	1	1 day	12 hours	max. 3.08 L/ha	—
Sercadis	31697	fluxapyroxad	7	0 days	12 hours	3	—
Serenade OPTI	31666	<i>Bacillus subtilis</i>	44	0 days	when dry	—	✓
Switch 62.5 WG	28189	cyprodinil + fludioxonil	9+12	1 day	12 hours	3	—
Tilt 250 E	19346	propiconazole	3	1 day	12 hours	4	—
Timorex Gold	30910	tea tree oil	46	2 days	4 hours	—	✓
Tivano	30468	citric acid + lactic acid	NC	—	when dry	—	✓
Vegol Crop Oil	32408	canola oil	NC	0 days	12 hours	2/4 ⁶	✓
Velum Prime	32108	fluopyram	7	0 days	12 hours	2	—
Plant growth regulators							
Apogee	28042	prohexadione calcium	NC	21 days	12 hours	3	—

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¹⁰ General re-entry. ¹¹ Training, pinching, hand pruning and hand harvest. ¹² Maximum 2 applications per year for maximum 2 years (maximum 4 applications per crop).

Notes on Strawberry Diseases and Insects

In this section:

- Table 3–11.** Activity of Fungicides on Strawberry Diseases and Impact on Honeybees, on this page.
Table 3–12. Activity of Insecticides and Miticides on Strawberry Pests and Impact on Honeybees, page 207.
Table 3–13. Strawberry Variety Disease Ratings, page 209.
Table 3–14. Miticides Registered on Strawberries, page 210.

Table 3–11. Activity of Fungicides on Strawberry Diseases and Impact on Honeybees

Please see the product label or crop calendars for registered uses. Use fungicides only for diseases listed on the product label for the crop and for the disease. The information provided in this table is intended to assist the grower in choosing the best fungicide for control of pests listed on the product label, while managing resistance and avoiding unnecessary sprays for non-target pests. Efficacy can be affected by rate of the product.

Group	Fungicide	Angular leaf spot	Anthraco­nose (C. acutatum)	Anthraco­nose (C. gloeosporioides)	Botrytis grey mould	Black root rot	Common leaf spot	Leather rot	Leaf scorch	Phomopsis leaf blight and fruit rot	Phytophthora crown rot	Powdery mildew	Red stele root	Honeybee Toxicity ¹
M	Bravo ZN	0	1	—	2 *	—	1	—	1	1	0	—	0	NT
M	Copper 53 W	2 P	1 P	1 P	1 P	—	1 * P	1 P	1 P	1 P	0	1 P	0	MT
M	Cueva	1	—	—	—	—	—	—	—	—	—	2 *	0	NT
M	Echo 90 DF	0	1	—	2 *	—	1	—	1	1	0	—	0	NT
M	Folpan 80 WDG	0	2	2	2 *	—	3 *	1	—	1–2	0	0	0	NT
M	Fracture	—	—	—	1 *	—	—	—	—	—	—	1 *	0	NT
M	Granuflo T	0	—	—	2 *	—	—	—	—	—	—	—	—	NT

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Plant extract.

0 = No control. 1 = Poor to fair control. 2 = Good control, some limitations. 3 = Excellent control, few if any limitations.

P = May be phytotoxic. R = Pathogen resistance to the fungicide has occurred in some locations. * (shaded area) = Disease is listed on the product label for control or suppression.

— = No information is available.

MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.

NT = Relatively non-toxic to bees.

¹ Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

Table 3–11. Activity of Fungicides on Strawberry Diseases and Impact on Honeybees (cont'd)

Group	Fungicide	Angular leaf spot	Anthrachnose (<i>C. acutatum</i>)	Anthrachnose (<i>C. gloeosporioides</i>)	Botrytis grey mould	Black root rot	Common leaf spot	Leather rot	Leaf scorch	Phomopsis leaf blight and fruit rot	Phytophthora crown rot	Powdery mildew	Red stele root	Honeybee Toxicity ¹
M	Maestro 80 DF	0	2	2	2 *	—	3 *	1	—	1–2	0	0	0	MT
M	Supra Captan 80 WDG	0	2	2	2 *	—	3 *	1	1	1–2	0	0	0	MT
1	Senator 50 SC	0	—	—	0–1 * R	—	2 *	—	—	—	—	2	—	NT
2	Rovral WP	0	0	0	3 * R	—	2	0	—	0	0	0	0	NT
3	Bumper 432 EC	0	0	0	0	—	3 *	0	—	3	0	3	0	NT
3	Fullback 125 SC	0	0	0	0	0	3	0	—	—	0	3 *	0	MT
3	Fitness	0	0	0	0	—	3 *	0	—	3	0	3	0	NT
3	Jade	0	0	0	0	—	3 *	0	—	3	0	3	0	NT
3	Mettle 125 ME	0	0	0	0	—	3	0	—	3	0	3 *	0	NT
3	Nova	0	0	0	0	—	3	0	—	3	0	3 *	0	NT
3	Tilt 250 E	0	0	0	0	—	3 *	0	—	3	0	3	0	NT
4	Ridomil Gold 480 SL	0	0	0	0	—	0	2	0	0	2–3	0	2–3 *	NT
7	Cantus WDG	0	—	—	3 *	—	3	0	3	0	0	2	0	NT
7	Fontelis	0	—	—	3 *	—	—	0	—	—	0	2 *	0	NT
7	Kenja 400 SC	0	0	0	3 *	—	—	0	—	—	0	2	0	NT
7	Sercadis	0	—	—	1 *	—	—	0	—	—	0	3 *	0	NT
7+9	Luna Tranquility	0	—	—	—	—	—	0	—	—	0	—	0	NT
7+11	Pristine WG	0	3 * R	3	3 *	—	3 *	0	3	3	0	3 *	0	NT
9	Scala SC	0	1	—	3 *	—	—	0	—	—	0	—	0	NT
9+12	Switch 62.5 WG	—	2 *	—	3 *	—	—	0	2	2	0	1 *	0	NT
11	Cabrio EG	0	3 *	3	1–2	—	1	0	2	3	0	3	0	NT
11	Flint	0	—	—	—	1	—	0	—	—	0	3 *	0	NT

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Plant extract.

0 = No control. 1 = Poor to fair control. 2 = Good control, some limitations. 3 = Excellent control, few if any limitations.

P = May be phytotoxic. R = Pathogen resistance to the fungicide has occurred in some locations. * (shaded area) = Disease is listed on the product label for control or suppression.

— = No information is available.

MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.

NT = Relatively non-toxic to bees.

¹ Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

Table 3–11. Activity of Fungicides on Strawberry Diseases and Impact on Honeybees (cont'd)

Group	Fungicide	Angular leaf spot	Anthraco-nose (<i>C. acutatum</i>)	Anthraco-nose (<i>C. gloeosporioides</i>)	Botrytis grey mould	Black root rot	Common leaf spot	Leather rot	Leaf scorch	Phomopsis leaf blight and fruit rot	Phytophthora crown rot	Powdery mildew	Red stele root	Honeybee Toxicity ¹
11	Intuity	0	—	—	— *	—	—	0	—	—	0	—	0	NT
11	Quadris Flowable	0	—	—	—	2 *	—	0	—	—	0	—	0	NT
12	Scholar 230 SC	0	—	—	—	2 *	—	0	—	—	0	—	0	NT
13	Quintec	0	0	0	0	—	0	0	0	0	0	3 *	0	MT
17	Elevate 50 WDG	0	0	0	3 *	—	—	0	0	0	0	0	0	NT
33	Aliette	0	—	—	0	—	0	2	0	0	2	0	2 *	NT
33	Confine Extra	0	1	—	0	—	0	2 *	0	0	2	0	2	NT
33	Phostrol	0	—	—	0	—	0	2 *	0	0	2	0	2	NT
44	Double Nickel LC	—	—	—	1 *	—	—	—	—	—	—	2 *	0	NT
44	Serenade OPTI	—	—	—	1 *	—	—	—	—	—	—	—	0	NT
NC	Actinovate SP	—	1 *	1	1 *	—	—	—	—	—	—	1 *	0	NT
NC	Purespray Green Spray Oil 13 E	—	—	—	—	—	—	—	—	—	—	2 *	0	—
NC	Tivano	1 *	—	—	—	—	—	—	—	—	—	1 *	0	NT
NC	Vegol Crop Oil	—	—	—	—	—	—	—	—	—	—	1–2 *	0	—
P5	Regalia Maxx	—	—	—	1 *	—	—	—	—	—	—	1 *	0	NT

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Plant extract.

0 = No control. 1 = Poor to fair control. 2 = Good control, some limitations. 3 = Excellent control, few if any limitations.

P = May be phytotoxic. R = Pathogen resistance to the fungicide has occurred in some locations. * (shaded area) = Disease is listed on the product label for control or suppression.

— = No information is available.

MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.

NT = Relatively non-toxic to bees.

¹ Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

Table 3–12. Activity of Insecticides and Miticides on Strawberry Pests and Impact on Honeybees

Use products only for pests listed on the label for the crop and for the pest. The information provided in this table is based on information from other areas. It is intended to assist the grower in choosing the best insecticide for control of pests listed on the product label, while managing resistance and avoiding unnecessary sprays for non-target pests. Efficacy can be affected by rate of the product.

Group	Insecticide/Miticide	Aphids	Clipper weevils	Tarnished plant bugs	Strawberry cutworm (crown borer)	Root weevil (adults)	Flower thrips	Leafrollers	Potato leafhoppers	Two-spotted spider mites	Cyclamen mites	Spittle bugs	Spotted wing drosophila	Honeybee Toxicity ¹
1B	Cygon 480-AG	3 *	1	3 *	2	—	NA	3	2	0 *	0	2	NA	HT
1B	Lagon 480 E	3 *	1	3 *	2	—	NA	3	2	0 *	0	2	NA	HT
1B	Malathion 85 E	1 *	1	2	2	0	—	2 *	2 *	— *	0	2	2	HT
1B	Pyrinex 480 EC	1	1	1	3 *	0	—	2	2	0	0	2	NA	HT
1B	Warhawk 480 EC	1	1	1	3 *	0	—	2	2	0	0	2	NA	HT
3	Decis 5 EC	0	0	3 *	—	0	2	3	2	0	0	2	3	HT
3	Mako	0	3 *	3 *	—	2	2	3	2	0	0	2 *	3	HT
3	Matador 120 EC	0	3 *	3 *	—	2 *	2	3	2	0	0	2 *	3	HT
3	Silencer 120 EC	0	3 *	3 *	—	2 *	2	3	2	0	0	2 *	3	HT
3	Up-Cyde 2.5 EC	0	3 *	3 *	—	2	2	3	2	0	0	2 *	3	HT
4A	Actara 25 WG	2	2	1	—	2 *	—	—	1	0	0	—	—	HT
4A	Admire 240 Flowable	3 *	2	—	—	1	—	—	3 *	0	0	—	—	HT
4A	Alias 240 SC	3 *	2	—	—	1	—	—	3	0	0	—	—	HT
4A	Assail 70 WP	3 *	—	2 *	—	—	—	—	3 *	0	0	2	1	MT
4A	Clutch 50 WDG	—	3	2 *	—	2	—	—	—	—	—	—	—	HT
4D	Sivanto Prime	3 *	—	—	—	—	2	—	—	—	—	—	—	MT

NC = Not classified by FRAC/IRAC, or group not indicated on product label.

0 = No control. 1 = Poor to fair control. 2 = Good control, some limitations. 3 = Excellent control, few if any limitations. NA = Not used at the timing for this pest.

* (shaded area) = Pests are listed on the product label for control or suppression. — = No information is available.

HT = Highly toxic to bees. Severe losses may be expected if used when bees are present at treatment time or within a few days thereafter.

MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.

NT = Relatively non-toxic to bees.

I = Irritant. White film barrier on plant tissue may act as a repellent to bees.

¹ Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

² May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

Table 3–12. Activity of Insecticides and Miticides on Strawberry Pests and Impact on Honeybees (cont'd)

Group	Insecticide/Miticide	Aphids	Clipper weevils	Tarnished plant bugs	Strawberry cutworm (crown borer)	Root weevil (adults)	Flower thrips	Leafrollers	Potato leafhoppers	Two-spotted spider mites	Cyclamen mites	Spittle bugs	Spotted wing drosophila	Honeybee Toxicity ¹
5	Delegate	—	—	—	2	—	2 *	2	—	0	0	—	3 *	HT
5	Entrust	0	—	—	2	—	2	3 *	—	0	0	—	3 *	HT
5	Success	0	—	—	2	—	2	3 *	—	0	0	—	3 *	HT
6	Agri-Mek SC	0	0	0	0	0	1	0	1	3 *	2 *	—	0	HT
9	Beleaf 50 SG	3 *	0	2 *	0	0	0	0	0	0	0	0	0	NT
10	Apollo SC	0	0	0	0	0	0	0	0	3 *	0	0	0	NT
11	Bioprotec CAF	0	0	0	—	0	0	2 *	0	0	0	0	0	NT
11	Dipel 2X DF	0	0	0	—	0	0	2 *	0	0	0	0	0	NT
15	Rimon 10 EC	—	—	3 *	—	—	—	3	—	0	0	—	0	MT ²
21	Nexter	0	0	0	0	0	0	0	0	3 *	2	0	0	HT
23	Oberon Flowable	0	0	0	0	0	0	0	0	3 *	—	0	0	NT
28	Altacor	0	—	0	—	—	—	3 *	0	0	0	0	0	NT
28	Exirel	3 *	—	—	—	—	2 *	3	—	—	—	—	3	HT
NC	Purespray Green Spray Oil 13 E	1 *	0	—	—	0	—	—	—	1 *	—	—	0	—
NC	Surround WP	—	—	—	—	—	NA	—	2 *	2	—	—	—	I
NC	Vegol Crop Oil	— *	—	—	—	—	—	—	—	— *	— *	—	—	—

NC = Not classified by FRAC/IRAC, or group not indicated on product label.

0 = No control. 1 = Poor to fair control. 2 = Good control, some limitations. 3 = Excellent control, few if any limitations. NA = Not used at the timing for this pest.

* (shaded area) = Pests are listed on the product label for control or suppression. — = No information is available.

HT = Highly toxic to bees. Severe losses may be expected if used when bees are present at treatment time or within a few days thereafter.

MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.

NT = Relatively non-toxic to bees.

I = Irritant. White film barrier on plant tissue may act as a repellent to bees.

¹ Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

² May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

Table 3–13. Strawberry Variety Disease Ratings

Variety	Leaf spot *	Leaf scorch ¹	Powdery mildew	Botrytis grey mould	Verticillium	Red stele ² *	Bacterial angular leaf spot ³	Black root rot	Anthraxnose fruit rot
Albion	MR	—	MR	S	R	—	S	—	MR
Allstar	MR	—	MR	MR	MR	S	HS	S	—
Annapolis	MR	MR	S	S	MR	R	HS	—	S
Brunswick	MR	MR	MR	MR	—	R	—	MR	—
Cabot	MR	MR	R	S	S	R	—	MR	—
Cavendish	MR	R	S	MR	MR	R	HS	MR	S
Evangeline	MR	R	MR	MR	S	S	—	S	—
Gov. Simcoe	MR	MR	HS	S	MR	S	S	—	HS
Honeoye	MR	MR	MR	MR	HS	S	HS	S	—
Jewel	MR	MR	S	MR	S	S	HS	HS	—
Kent	HS	HS	MR	S	S	S	HS	HS	S
L'Amour	—	—	S	MR	—	MR	S	MR	—
Mira	HS	R	R	MR	S	R	S	S	—
Mohawk	MR	MR	MR	MR	MR	MR	—	—	—
Sable	R	R	S	S	—	R	HS	—	—
St. Pierre	MR	S	MR	R	—	S	—	—	S
Sapphire	—	MR	MR	—	—	—	—	—	S
Seascape	S	—	HS	—	—	—	—	—	—
Serenity	—	MR	MR	—	—	—	—	—	S
Sparkle	S	MR	MR	MR	S	HR	S	—	—
Summer Dawn (V151)	S	S	—	—	—	—	—	—	HS
Summer Rose (R14)	—	—	—	—	—	—	—	—	S
Summer Ruby (2V55)	—	—	—	—	—	—	—	—	S
Summer Evening (108Y79)	—	—	—	—	—	—	—	—	S
Tribute	MR	MR	S	MR	R	MR	—	—	—
Tristar	MR	MR	S	MR	R	MR	MR	—	—
Valley Sunset	—	—	S	S	—	—	S	—	—
Wendy	S	MR	MR	MR	S	MR	HS	S	—

HR = Highly Resistant. R = Resistant. MR = Moderately Resistant. S = Susceptible. HS = Highly Susceptible. — = Information is unavailable.

* Race dependent.

¹ Leaf scorch ratings according to Xue, Sutton, Dale, and Sullivan (1996), for some cultivars.

² Red stele ratings from Dr. N. Nickerson and Dr. A. Jamieson, Agriculture & Agri-Food Canada, Kentville, Nova Scotia.

³ P.D. Hildebrand, P.G. Braun et. al., *Can. J. Plant. Pathol.* 27:16–24 (2005) and field observation.

Table 3–14. Miticides Registered on Strawberries

Miticide	Mite Species Controlled	Stage of Mite Controlled	Timing and Comments	Preharvest Interval
Agri-Mek SC	two-spotted spider mite, cyclamen mite	nymphs, adults	Apply to active mites (adults or nymphs). Agri-Mek is translaminar (locally systemic). It is absorbed best by new, expanding leaves, and less effective late in the season when foliage is hardened.	3 days
Apollo SC	two-spotted spider mite	eggs, very young nymphs	Apply when most mites are in the egg stage. This miticide works best if applied early in the season, when generations tend to be most synchronous.	15 days
Nexter	two-spotted spider mite	nymphs, adults	Nexter is a contact miticide providing rapid knock-down of adults and nymphs.	10 days
Oberon Flowable	two-spotted spider mite	eggs, nymphs, adults	Oberon is a slow-acting miticide which prevents eggs from hatching and nymphs from moulting to the next stage. Best used when mites are young.	3 days
Nealta	two-spotted spider mite	eggs, nymphs, adults	Nealta has intermediate activity and works best if applied as mite populations build, before damage is observed. Knockdown may be enhanced by increased coverage and the addition of a surfactant.	1 day
Purespray Green Spray Oil 13 E	two-spotted spider mite	eggs, nymphs, adults	Mineral oil acts as a miticide by suffocating mites and mite eggs on contact. Excellent coverage is needed for control, because there is no residual control from this product. Apply at first sign of activity.	—
Vegol Crop Oil	two-spotted spider mite, cyclamen mite	eggs, nymphs, adults	Canola oil acts as a miticide by suffocating mites and mite eggs on contact. Excellent coverage is needed for control, because there is no residual control from this product. Apply at first sign of activity.	0 days

Adjuvants Used in Fruit Crops

Spray adjuvants are tank-mix additives used to modify and enhance the effectiveness of the pesticide. They include surfactants, spreader/stickers, crop oils, anti-foaming agents, buffering agents, etc. Unless the product label specifies an adjuvant be added to the tank, growers do not need to use them.

A label may specify a particular name brand, or generalize a category of adjuvant. In the latter case, the grower is free to use any adjuvant in that category, provided it is registered for use on the crop. Always use adjuvants as directed on the product label. See Table 3–15. *Adjuvants Used in Ontario*, on this page, for common adjuvants used in fruit crops.

Table 3–15. Adjuvants Used in Ontario

Some pesticides used together or in close succession to crop oils or other adjuvants can cause crop injury. Do not use Supra Captan, Maestro, Folpan, Bravo, Echo or sulphur-based products with crop oils or adjuvants which are used to increase pesticide uptake. Crop safety issues can also occur around some formulations of copper or specific products, such as Group 11 fungicides. Read product labels closely for additional precautions around product compatibility with surfactants or crop oils. For more information on adjuvants, see sprayers101.com or Purdue Extension, *Adjuvants and the Power of the Spray* at ppp.purdue.edu/wp-content/uploads/2016/08/PPP-107.pdf.

Trade Name	Registration Number	Adjuvant Type	Characteristics
Agral 90	11809 24725	non-ionic surfactant	- wetter-spreader - compatible with most pesticides¹ - helps pesticide penetrate plant cuticle
Ipco Ag-Surf	15881	non-ionic surfactant	- wetter-spreader - compatible with most pesticides¹ - helps pesticide penetrate plant cuticle
LI 700	23026	non-ionic surfactant	- wetter-spreader - compatible with most pesticides¹ - helps pesticide penetrate plant cuticle - additional properties: pH adjuster, sticker
Purespray Green Spray Oil 13 E	27666	crop oil (mineral)	Helps pesticide penetrate plant cuticle or insect exoskeleton
Xiameter OFX-0309	23078	silicone surfactant (organosilicone)	- wetter-spreader - helps pesticide penetrate plant cuticle - reduces surface tension - improves rainfastness

¹ Check product label for precautions around surfactant compatibility before using.

GRAPE CALENDAR

In this section:

- Read the product label and follow all safety precautions. 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>.
- For preharvest intervals, restricted entry intervals and maximum number of applications, see Table 4–1. *Products Used on Grapes*, page 232.
- Some grape varieties are sensitive to sulphur, copper, Flint, Pristine, or other products. See Table 4–2. *Relative Susceptibility of Grape Cultivars to Diseases*, page 236, for specific information.
- **Products are listed by chemical group and in alphabetical order within each group. The order does not reflect efficacy.** See Table 4–3. *Activity of Fungicides on Grape Diseases and Honeybees*, page 238 and Table 4–4. *Activity of Insecticides on Grape Insect Pests and Honeybees*, page 241, for efficacy ratings.
- Where a product in the calendar is followed by a “*”, it is potentially acceptable for organic use based on *Ministère de l’Agriculture, des Pêcheries et de l’Alimentation du Québec publication Bulletin D’Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with your certifying body to verify the acceptability of any product prior to using it.

Resistance Management

To delay development of resistance to insecticides, miticides and fungicides, follow resistance management guidelines outlined in *Resistance Management Strategies*, page 393. The chemical group is indicated in the column labelled “Group” before the “Product” column. Products belonging to the same chemical group are grouped together in the calendar. Multi-site (M) fungicides are not prone to resistance and do not have to be rotated. Some products are not classified to mode of action (NC) and others have unknown modes of action (U or UN). Group 44 and 46 fungicides are not known to be prone to resistance.

Fungicide resistance management

Take the following steps to avoid rapid development of fungicide resistance:

- Do not reduce rates below those specified on the label.
- Do not use products containing the same chemical group in consecutive applications.
- Use co-formulations or products that must be tank-mixed with another chemical group no more than 3 times per season.
- Use products containing only one chemical family no more than twice per season.
- Use sufficient water to provide thorough coverage.
- Do not use Rovral, Fullback, Mettle, Nova, Inspire Super, Priwen, Aprovia Top, Cantus, Kenja, Sercadis, Luna Tranquility, Pristine, Scala, Switch, Flint, Intuity, Sovran, Quintec, Elevate, Forum, Revus, Zampro or Vivando when sporulating lesions of the target disease are present.

Insecticide resistance management

Take the following steps to avoid development of insecticide resistance:

- For pests with discrete generations (grape berry moth), do not use insecticides from the same group for more than one generation. Within a generation, if more than one spray is required, use a product from the same chemical group.
- For pests with rapidly building and overlapping generations (mites, leafhoppers, phylloxera), do not use products containing the same chemical group in consecutive applications.

Bee Toxicity

Some insecticides are toxic to bees and other pollinating insects. Use of insecticides on flowering crops requires careful management to avoid negative effects on pollinators. Do not apply insecticides during bloom. Before and after bloom, bees may still be present on flowering cover crops and weeds—do not allow drift of insecticides onto these or other flowering crops. Always follow label precautions regarding avoiding impacts on bees. For more information, see *Bee Poisoning*, page 5, and honeybee toxicity ratings in Table 4–3. *Activity of Fungicides on Grape Diseases and Honeybees*, page 238 and Table 4–4. *Activity of Insecticides on Grape Insect Pests and Honeybees*, page 241.

Buffer Zones

Leave a suitable buffer zone between treatment area and adjacent sensitive areas, such as hedgerows, woodlots and freshwater habitats. Zones may vary depending on the product used, growth stage of the crop and method of application including the use of drift-reducing technology. Check the pesticide label for requirements.

Use Health Canada's online spray drift calculator to modify the buffer zone specified on the label based on weather conditions, category of spray equipment and 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. Unfortunately, this model does not account for carrier volume, travel speed or crop stage.

Observing buffer zones is a legal requirement. A record of the buffer zone modification, if any, must be retained for at least one year from the time of application.

Preharvest Intervals

Contact the processors and wineries directly in regard to their preharvest interval policy. Preharvest intervals listed in Table 4–1. *Products Used on Grapes*, page 232, are taken from product labels. In some cases, regulations on residues in finished products are much more stringent. Many processors require longer preharvest intervals than stated on product labels. Some processors and wineries also have special restrictions for certain pest control products regarding number of applications or application after a certain crop stage. Consult the grape purchaser for more details.

Spray Water Volumes

Sufficient water volumes are necessary to provide complete coverage with grape fungicides, miticides and insecticides. Increased water volumes are necessary as the season progresses and canopies grow. Canopy management through hedging, leaf-pulling and shoot thinning, as well as proper sprayer calibration, is critical to ensure proper spray coverage. Sufficient coverage and efficacy are not possible if water volumes are inadequate. Some types of sprayers are able to provide sufficient coverage with less water than others. Consult equipment dealers or professional crop consultants about the amount of water needed to ensure adequate coverage. Where the product rate is listed in amount per 1,000 L and if a water volume is not provided on the label, use enough water to wet the foliage. Read and follow water volume requirements on all product labels.

Crop Nutrition

Crop nutrition is important for plant growth and fruit quality on berry crops. Soil testing, plant tissue analysis and visual deficiency symptoms all play an important role in assessing and monitoring the crop's nutritional status. For more information, visit <http://www.omafra.gov.on.ca/english/crops/hort/grape.html> (click on *Soil Management, Fertilizer Use, Crop Nutrition and Cover Crops for Fruit Production*) and see OMAFRA Publication 611, *Soil Fertility Handbook*. For soil testing and plant tissue analysis services, see Appendix E: *Accredited Soil-Testing Laboratories in Ontario*, page 435.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Dormant to bud swell						
Powdery mildew	M	Lime sulphur *	73 L/1,000 L water	48 hours	120 days	Apply in a high-volume spray to ensure thorough coverage of canes, head and trunk. Suppression of overwintering inoculum. May also suppress anthracnose and scale insects. Do not use later than delayed dormant.
Scale	General Comments: - If grape leafroll-associated virus has been confirmed by an accredited lab and scale has been confirmed in the vineyard, this spray may reduce insect vector pressure and spread of the virus. - Examine female scales and apply when crawlers are present among the eggs under scales. Controls only exposed scale not under bark.					
	NC	Vegol Crop Oil *	2% v/v	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage at a rate of 2% v/v (20 L/1,000 L water). Tolerance has not been determined for all varieties. Test a small area of each variety prior to spraying the whole block. Do not apply within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed vines. Do not use within 14 days of Supra Captan, Maestro, Folpan or copper and 30 days of sulphur. Do not apply to wet foliage.
Bud burst to first leaf						
Climbing cutworm	General Comments: - Apply in the evening at first sign of cutworm feeding on buds. - Apply in a high-volume spray to ensure thorough coverage on trunks, cordons, canes, unopened buds and tender shoots.					
	3	Pounce 384 EC	180 mL/ha	when dry	21 days	Increase rate to 360 mL/ha if cutworms are large (2–3 cm). Apply in a minimum of 450 L of water/ha. Spray trunk and soil surface within 0.5 m of the trunk. Do not disturb the soil for 5 days after spraying.
	18	Intrepid	600 mL/ha	12 hours	30 days	Maximum of 2 applications per season.
	28	Altacor	285 g/ha	12 hours	14 days	Maximum of 2 applications per season.
Scale	NC	Vegol Crop Oil *	2% v/v	12 hours	0 days	See comments on this product for Scale at Dormant .
First leaf, 1.25–5 cm shoot length						
Anthracnose	General Comments: - Apply in a high-volume spray to ensure thorough coverage. - Alternate row spraying will not give adequate protection from anthracnose.					
	3	Nova	340 g/ha	12 hours ¹ /7 days ²	14 days	Suppression only.
	3+9	Inspire Super	836–1,161 mL/ha	7 days	14 days	Use high rate under high disease pressure.

¹ General re-entry. ² Hand labour (e.g., training, thinning, leaf pulling, hand harvest). ³ Preharvest interval is 1 day for table grapes or 21 days for wine grapes.

⁴ Check with processor and winery for wine grapes. ⁵ Preharvest interval is 14 days for table grapes. ⁶ Preharvest interval for mechanical harvest / hand harvest.

— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
First leaf, 1.25–5-cm shoot length						
Phomopsis cane and leaf spot	General Comments: - Spray susceptible varieties, especially if the weather is wet and there is a history of phomopsis in the vineyard. - Alternate row spraying will not give adequate protection from phomopsis. See Table 4–2. <i>Relative Susceptibility of Grape Cultivars to Diseases</i>, page 236.					
	M	Folpan 80 WDG	1.25 kg/ha	24 hours	1 day	No product specific comments.
		Maestro 80 DF or Supra Captan 80 WDG	2 kg/ha 1.2 kg/1,000 L water	72 hours	7 days	Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Timorex Gold.
3–5 leaves unfolded, 10–15-cm shoot length						
Erineum mite	General Comments: - Apply immediately after the first evidence of erineum mite activity and again at mid-season. - Do not use on Concord, Foch or deChaunac varieties.					
	NC	Cosavet DF Edge * or Kumulus DF * or Microthiol Disperss *	3.4 kg/ha	24 hours	1 day/21 days ³	Do not use within 14 days of Purespray Green Spray Oil and 30 days of Vegol Crop Oil.
Phomopsis cane and leaf spot	Use one of the products listed for Phomopsis cane and leaf spot at First leaf, 1.25–5-cm shoot length .					
Anthracnose	3	Nova	340 g/ha	12 hours ¹ /7 days ²	14 days	Suppression only.
	3+9	Inspire Super	836–1,161 mL/ha	7 days	14 days	Use high rate under high disease pressure. May cause damage to Concord.
	7+11	Pristine WG	735 g/ha	when dry ¹ /21 days ²	14 days	Do not use on Concord, Fredonia or related varieties or on table grapes.
Black rot	General Comments: - Spray susceptible varieties, especially where there is a history of black rot and conditions are wet. - Alternate row spraying will not give adequate protection from black rot.					
	M	Copper 53 W *	3 kg + 6 kg lime/ 1,000 L water	48 hours	2 days ⁴	Suppression only. Do not apply to Vidal, Concord or Niagara varieties.
		Ferbam 76 WDG	2 kg/1,000 L water	12 hours	7 days	No product specific comments.
		Manzate Pro-Stick or Penncozeb 75 DF Raincoat	7.2 kg/ha	24 hours	30 days	No product specific comments.
		Polyram DF	2 kg/1,000 L water	12 hours	45 days	No product specific comments.
	3	Mettle 125 ME	292–365 mL/ha	12 hours ¹ /15 days ²	15 days	These products are locally systemic. Consult labels for information on drying time required before rain.
		Nova	200 g/ha	12 hours ¹ /7 days ²	14 days	

¹ General re-entry. ² Hand labour (e.g., training, thinning, leaf pulling, hand harvest). ³ Preharvest interval is 1 day for table grapes or 21 days for wine grapes.

⁴ Check with processor and winery for wine grapes. ⁵ Preharvest interval is 14 days for table grapes. ⁶ Preharvest interval for mechanical harvest / hand harvest.

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Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
3–5 leaves unfolded, 10–15-cm shoot length						
Black rot (cont'd)	3+9	Inspire Super	1.48 L/ha	7 days	14 days	May cause damage to Concord. This product is locally systemic. Consult label for information on drying time required before rain.
Powdery mildew	General Comments: - Unless otherwise indicated, apply at 7–10-day intervals to protect expanding leaves and developing fruit clusters before symptoms appear. Apply at 7-day intervals if weather is conducive to disease or if rapid shoot growth is occurring. - Alternate row spraying will not give adequate protection from powdery mildew. - Group 3, 7, 9, 11, 13 and U8 fungicides are locally systemic. Consult labels for information on drying time required before rain.					
	M	Cosavet DF Edge * or Kumulus DF * or Microscopic Sulphur WP * or Microthiol Disperss *	12.6 kg/ha 12.6 kg/ha 4.5 kg/1,000 L water 12.6 kg/ha	24 hours	1 day/21 days ³	Do not use within 14 days of Purespray Green Spray Oil and 30 days of Vegol Crop Oil.
		Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	No product specific comments.
		Fracture	1.7–3.3 L/ha	when dry	0 days	Suppression only. Use high rate with high disease pressure. Do not mix with foliar fertilizers.
	3	Fullback 125 SC	585–731 mL/ha	12 hours ¹ /7 days ²	14 days	No product specific comments.
		Mettle 125 ME	219–365 mL/ha	12 hours ¹ /15 days ²	15 days	No product specific comments.
		Nova	200 g/ha	12 hours ¹ /7 days ²	14 days	No product specific comments.
	3+7	Aprovia Top 195 EC	643 mL/ha	48 hours	21 days	No product specific comments.
	3+9	Inspire Super	836 mL/ha	7 days	14 days	May cause damage to Concord.
	7	Cantus WDG	315 g/ha	12 hours	14 days	No product specific comments.
		Sercadis	250 mL/ha	12 hours	14 days	No product specific comments.
	7+9	Luna Tranquility	600 mL/ha	12 hours ¹ / 24 hours ²	7 days	No product specific comments.
	11	Intuity	439–877 mL/ha	12 hours	10 days	Suppression only.
	13	Quintec	300 mL/ha	12 hours	14 days	No product specific comments.
	44	Double Nickel LC *	2.5–5.0 L/ha	when dry	0 days	Suppression only. Use 5.0–10 L/ha with high disease pressure.
		Serenade OPTI *	1.7–3.3 kg/ha	when dry	0 days	Suppression only.
	46	Timorex Gold *	1.5–2.0 L/ha	4 hours	2 days	Do not tank-mix or alternate with Supra Captan, Maestro or sulphur products. See label for precautions on compatibility.

¹ General re-entry. ² Hand labour (e.g., training, thinning, leaf pulling, hand harvest). ³ Preharvest interval is 1 day for table grapes or 21 days for wine grapes.

⁴ Check with processor and winery for wine grapes. ⁵ Preharvest interval is 14 days for table grapes. ⁶ Preharvest interval for mechanical harvest / hand harvest.

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Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
3–5 leaves unfolded, 10–15-cm shoot length						
Powdery mildew (cont'd)	NC	Actinovate SP *	425–840 g/ha	when dry	—	Suppression only. Apply in 500–1,000 L water/ha. Do not combine with other pesticides (especially copper products), adjuvants, surfactants or foliar fertilizers.
		Buran *	1.8% v/v	when dry	0 days	Suppression only. This is a new product in Ontario and little evidence of its efficacy is available. Apply no more than 18 L/ha per spray. Reapply every 7–10 days if needed. Do not apply if rain is forecast within 48 hours.
		MilStop * or Sirocco *	2.8–5.6 kg/ha	4 hours	0 days	Work as eradicants and have little protective activity. Use the lower rate in 500 L of water and the higher rate in 1,000 L of water. Create a mildly alkaline solution. Do not tank-mix with pH adjusters, oil or products not compatible with mild alkaline solutions.
		Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	14 days ^{4,5}	Apply in a high-volume spray to ensure thorough coverage. Tolerance has not been determined for all varieties. Test a small area of each variety prior to spraying the whole block. Do not use within 14 days of Captan, Maestro, Folpan, Ambush, Perm-Up, Pounce or sulphur products. Do not apply within 48 hours of freezing temperatures, when temperatures are high (above 30°C), just prior to rain or to crops under moisture stress. Multiple applications, especially after cluster closure, may cause Brix reduction.
		Vegol Crop Oil *	2% v/v	12 hours	0 days	Suppression only. Apply in a high-volume spray to ensure thorough coverage at a rate of 2% v/v (20 L/1,000 L water). Tolerance has not been determined for all varieties. Test a small area of each variety prior to spraying the whole block. Do not apply within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed vines. Do not use within 14 days of Supra Captan, Maestro, Folpan or copper and 30 days of sulphur. Do not apply to wet foliage.
	P5	Regalia Maxx *	0.125–0.25% v/v in 500–1,500 L water	when dry	0 days	Suppression only. Apply before symptoms develop. Use 0.125% (1.25 L in 1,000 L water) in a tank-mix with other powdery mildew fungicides or 0.25% (2.5 L in 1,000 L water) in rotation with other powdery mildew fungicides.
	U8	Vivando SC	750 mL/ha	12 hours	14 days	Do not apply at intervals of less than 14 days.
		Property 300 SC	300–366 mL/ha	12 hours	0 days	

¹ General re-entry. ² Hand labour (e.g., training, thinning, leaf pulling, hand harvest). ³ Preharvest interval is 1 day for table grapes or 21 days for wine grapes.

⁴ Check with processor and winery for wine grapes. ⁵ Preharvest interval is 14 days for table grapes. ⁶ Preharvest interval for mechanical harvest / hand harvest.

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Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Special sprays						
Scale	General Comments: - If grape leafroll-associated virus has been confirmed by an accredited lab and scale has been confirmed in the vineyard, this spray may reduce insect vector pressure and spread of the virus. - Examine female scales and apply when crawlers are present among the eggs under scales. Control only exposed scales, not those under bark.					
	1B	Malathion 85 E	880 mL/1,000 L water	12 hours ¹ /4 days ²	3 days	No product specific comments.
	NC	Kopa * or Opal *	2% v/v 1% v/v	12 hours	0 days	Begin applications when populations are low and reapply every 1–3 weeks as needed. Test a small area of each variety prior to spraying the whole block. Applying soaps more than 3 times may cause plant injury. See label for details. Avoid application in direct sunlight or to vines under stress. Application within 3 days of sulphur may increase plant injury on sensitive varieties.
		Vegol Crop Oil *	2% v/v	12 hours	0 days	See comments on this product for Scale at Dormant .
Shoot length 20–25 cm						
Erineum mite	Use one of the products listed for Erineum mite at 3–5 leaves unfolded, 10–15-cm shoot length .					
Grape berry moth	NC	Isomate-GBM Plus *	500 dispensers/ha	—	—	Reduces mating of grape berry moth. Apply prior to first flight. Border sprays of insecticide or higher rates of pheromone (1,000 dispensers/ha) may be required where pressure is high. Dispensers last up to 150 days. For more information on mating disruption, see OMAFRA Factsheet 03–079, <i>Mating Disruption for Management of Insect Pests</i> .
Phylloxera (leaf form)	General Comments: Apply when galls are first observed.					
	4A	Assail 70 WP	80 g/ha	12 hours ¹ /5 days ²	3 days/5 days ⁶	No product specific comments.
	23	Movento 240 SC	365 mL/ha	12 hours	7 days	Will redistribute to young leaves as they develop. Control may not be apparent for 2–3 weeks. Consecutive applications should be at least 30 days apart. Tank-mix with a non-ionic surfactant at 0.2% v/v (2 L/ 1,000 L). See label and Table 4–5. <i>Adjuvants Used in Ontario</i> , page 243, for further details. Do not apply to table grapes. This timing will also control mealy bug and suppress scale. Refer to mealy bug and scale at Immediate prebloom .
Phomopsis cane and leaf spot	Use one of the products listed for Phomopsis cane and leaf spot at First leaf, 1.25–5-cm shoot length .					
Anthracnose	Use one of the products listed for Anthracnose at 3–5 leaves unfolded, 10–15-cm shoot length .					

¹ General re-entry. ² Hand labour (e.g., training, thinning, leaf pulling, hand harvest). ³ Preharvest interval is 1 day for table grapes or 21 days for wine grapes.

⁴ Check with processor and winery for wine grapes. ⁵ Preharvest interval is 14 days for table grapes. ⁶ Prehavest interval for mechanical harvest / hand harvest.

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¹ General re-entry. ² Hand labour (e.g., training, thinning, leaf pulling, hand harvest). ³ Preharvest interval is 1 day for table grapes or 21 days for wine grapes.

⁴ Check with processor and winery for wine grapes. ⁵ Preharvest interval is 14 days for table grapes. ⁶ Preharvest interval for mechanical harvest / hand harvest.

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Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Shoot length 20–25 cm						
Black rot	General Comments: - Spray susceptible varieties, especially where there is a history of black rot and conditions are wet. - Alternate row spraying will not give adequate protection from black rot. - Group 3, 7, 9 and 11 fungicides are locally systemic. Consult labels for information on drying time required before rain.					
	M	Copper 53 W *	3 kg + 6 kg lime/ 1,000 L water	48 hours	2 days ⁴	Suppression only. Do not apply to Vidal, Concord or Niagara varieties.
		Dithane Rainshield or Manzate Pro-Stick or Penncozeb 75 DF Raincoat	7.2 kg/ha	12 hours 24 hours 24 hours	30 days	No product specific comments.
		Polyram DF	2 kg/1,000 L water	12 hours	45 days	No product specific comments.
	3	Fullback 125 SC	585–731 mL/ha	12 hours ¹ /7 days ²	14 days	No product specific comments.
		Mettle 125 ME	292–365 mL/ha	12 hours ¹ /15 days ²	15 days	Use high rate under high disease pressure.
		Nova	200 g/ha	12 hours ¹ /7 days ²	14 days	No product specific comments.
	3+9	Inspire Super	1.48 L/ha	7 days	14 days	May cause damage to Concord.
	7+11	Pristine WG	735 g/ha	when dry ¹ /21 days ²	14 days	When used as directed, will help reduce anthracnose. Do not use on Concord, Fredonia or related varieties or on table grapes.
	11	Flint	140 g/ha	12 hours ¹ /5 days ²	14 days	Do not apply to Concord grapes.
		Sovran	240 g/ha	48 hours	14 days	Phytotoxic to some cherry varieties. See label for details. Do not allow product drift onto sensitive crops.
Powdery mildew	General Comments: - Unless otherwise indicated, apply at 7–10-day intervals to protect expanding leaves and developing fruit clusters before symptoms appear. Apply at 7-day intervals if weather is conducive to disease or if rapid shoot growth is occurring. - Alternate row spraying will not give adequate protection from powdery mildew. - Group 3, 5, 7, 9, 11, 13 and U8 fungicides are locally systemic. Consult labels for information on drying time required before rain.					
	M	Cosavet DF Edge * or Kumulus DF * or Microscopic Sulphur WP * or Microthiol Disperss *	12.6 kg/ha 12.6 kg/ha 4.5 kg/1,000 L water 12.6 kg/ha	24 hours	1 day/21 days ³	Do not use within 14 days of Purespray Green Spray Oil and 30 days of Vegol Crop Oil.
		Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	No product specific comments.
		Fracture	1.7–3.3 L/ha	when dry	0 days	Suppression only. Use high rate under high disease pressure. Do not mix with foliar fertilizers.

¹ General re-entry. ² Hand labour (e.g., training, thinning, leaf pulling, hand harvest). ³ Preharvest interval is 1 day for table grapes or 21 days for wine grapes.

⁴ Check with processor and winery for wine grapes. ⁵ Preharvest interval is 14 days for table grapes. ⁶ Preharvest interval for mechanical harvest / hand harvest.

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Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Shoot length 20–25 cm						
Powdery mildew (cont'd)	3	Fullback 125 SC	585–731 mL/ha	12 hours ¹ /7 days ²	14 days	No product specific comments.
		Mettle 125 ME	219–365 mL/ha	12 hours ¹ /15 days ²	15 days	No product specific comments.
		Nova	200 g/ha	12 hours ¹ /7 days ²	14 days	No product specific comments.
	3+7	Aprovia Top 195 EC	643 mL/ha	48 hours	21 days	No product specific comments.
	3+9	Inspire Super	836 mL/ha	7 days	14 days	May cause damage to Concord.
	5	Priwen	400–600 mL/ha	12 hours ¹ /17 days ²	35 days	No product specific comments.
	7	Cantus WDG	315 g/ha	12 hours	14 days	No product specific comments.
		Sercadis	250 mL/ha	12 hours	14 days	No product specific comments.
	7+9	Luna Tranquility	600 mL/ha	12 hours ¹ /24 hours ²	7 days	No product specific comments.
	7+11	Pristine WG	420–735 g/ha	when dry ¹ /21 days ²	14 days	When used as directed, will help reduce anthracnose. Do not use on Concord, Fredonia or related varieties or on table grapes.
	11	Flint	140 g/ha	12 hours ¹ /5 days ²	14 days	Do not apply to Concord grapes.
		Intuity	439–877 mL/ha	12 hours	10 days	Suppression only. Rainfast after 2 hours. Do not use with organosilicate surfactants. Under high disease pressure, use high rate and shorten interval between applications.
		Sovran	300 g/ha	48 hours	14 days	Phytotoxic to some cherry varieties. See label for details. Do not allow product drift onto sensitive crops.
	13	Quintec	300 mL/ha	12 hours	14 days	No product specific comments.
	44	Double Nickel LC *	2.5–5.0 L/ha	when dry	0 days	Suppression only. Use 5–10 L/ha under high disease pressure.
		Serenade OPTI *	1.7–3.3 kg/ha	when dry	0 days	Suppression only.
	46	Timorex Gold *	1.5–2.0 L/ha	4 hours	2 days	Do not tank-mix or alternate with Supra Captan, Maestro or sulphur products. See label for precautions on compatibility.
	NC	Actinovate SP *	425–840 g/ha	when dry	—	Suppression only. Apply in 500–1,000 L water/ha. Do not combine with other pesticides (especially copper products), adjuvants, surfactants or foliar fertilizers.
		Buran *	1.8% v/v	when dry	0 days	Suppression only. This is a new product in Ontario and little evidence of its efficacy is available. Apply no more than 18 L/ha per spray. Reapply every 7–10 days if needed. Do not apply if rain is forecast within 48 hours.
		MilStop * or Sirocco *	2.8–5.6 kg/ha	4 hours	0 days	See comments on these products for Powdery mildew at 3–5 leaves unfolded, 10–15-cm shoot length.

¹ General re-entry. ² Hand labour (e.g., training, thinning, leaf pulling, hand harvest). ³ Preharvest interval is 1 day for table grapes or 21 days for wine grapes.

⁴ Check with processor and winery for wine grapes. ⁵ Preharvest interval is 14 days for table grapes. ⁶ Preharvest interval for mechanical harvest / hand harvest.

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Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Shoot length 20–25 cm						
Powdery mildew (cont'd)	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	14 days ^{4,5}	Suppression only. See comments on this product for Powdery mildew at 3–5 leaves unfolded, 10–15-cm shoot length.
		Vegol Crop Oil *	2% v/v	12 hours	0 days	Suppression only. See comments on this product for Powdery mildew at 3–5 leaves unfolded, 10–15-cm shoot length.
	P5	Regalia Maxx *	0.125–0.25% v/v in 500–1,500 L water	when dry	0 days	Suppression only. Apply before symptoms develop. Use 0.125% (1.25 L in 1,000 L water) in a tank-mix with other powdery mildew fungicides or 0.25% (2.5 L in 1,000 L water) in rotation with other powdery mildew fungicides.
	U8	Vivando SC	750 mL/ha	12 hours	14 days	Do not apply at intervals of less than 14 days.
		Property 300 SC	300–366 mL/ha	12 hours	0 days	No product specific comments.
Downy mildew	General Comments: Apply at 7–10-day intervals to protect expanding leaves and developing fruit clusters. Apply at shorter intervals if weather is conducive to disease. Consult label for information on dry time required before rain.					
	M	Copper 53 W *	3 kg + 6 kg lime/1,000 L water	48 hours	2 days ⁴	Do not apply to Vidal, Concord or Niagara varieties.
		Copper Spray * or Guardsman Copper Oxychloride 50 *	3 kg + 6 kg lime/1,000 L water 3 kg + 6 kg lime/ha	48 hours	2 days ⁴	
		Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	Do not mix with lime.
		Dithane Rainshield or Manzate Pro-Stick or Penncozeb 75 DF Raincoat	7.2 kg/ha	12 hours 24 hours 24 hours	30 days	No product specific comments.
		Folpan 80 WDG	1.25 kg/ha	24 hours	1 day	No product specific comments.
		Kocide 2000 *	1.6 kg/ha	48 hours	2 days	Always test for sensitivity. The addition of 454–1,360 g hydrated lime/454 g of Kocide may reduce phytotoxicity.
		Maestro 80 DF or Supra Captan 80 WDG	2 kg/ha 1.5 kg/1,000 L water	72 hours	7 days	Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Timorex Gold.
		Polyram DF	2 kg/1,000 L water	12 hours	45 days	No product specific comments.
	4+M	Ridomil Gold MZ 68 WG	2.5 kg/ha	24 hours	66 days	This product is fully systemic and will redistribute to young leaves and fruit as they develop.

¹ General re-entry. ² Hand labour (e.g., training, thinning, leaf pulling, hand harvest). ³ Preharvest interval is 1 day for table grapes or 21 days for wine grapes.

⁴ Check with processor and winery for wine grapes. ⁵ Preharvest interval is 14 days for table grapes. ⁶ Preharvest interval for mechanical harvest / hand harvest.

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Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Shoot length 20–25 cm						
Downy mildew (cont'd)	7+11	Pristine WG	675–735 g/ha	when dry ¹ /21 days ²	14 days	Do not use on Concord, Fredonia or related varieties or on table grapes. This product is locally systemic.
	11	Sovran	300 g/ha	48 hours	14 days	Phytotoxic to some cherry varieties. See label for details. Do not let product drift onto sensitive crops. This product is locally systemic.
	21	Torrent 400 SC	150–200 mL/ha	12 hours	30 days	Do not use with a surfactant. Spray volume to be used will vary with the amount of plant growth and should be at least 400 L/ha.
	22+M	Gavel 75 DF	2.25 kg/ha	48 hours	66 days	No product specific comments.
	33	Aliette	3.75 kg/ha	6 days	15 days	This product is fully systemic and will redistribute to young leaves as they develop.
		Confine Extra or Phostrol or Rampart	2.9–5.8 L/ha 2.9–5.8 L/ha 2.5–5.0 L/ha	12 hours 12 hours 4 hours	1 day 0 days 1 day	Use the lower rate in 500 L of water and the higher rate in 1,000 L of water. Phytotoxicity may occur if concentration is increased above the label rate or tank-mixed with a surfactant. Apply at 1–3-week intervals, using the high rate and short interval under high disease pressure. These products are fully systemic and will redistribute to young leaves and fruit as they develop. Do not apply Phostrol to vines that are heat-stressed, within 20 days of copper or when conditions favour prolonged wet periods (>4 hours).
	40	Forum	450 mL/ha	12 hours ¹ /12 days ²	14 days	Tank-mix with another protectant downy mildew fungicide from Group M. Do not use less than 200 L water/ha. This product is fully systemic and will redistribute to young leaves and fruit as they develop.
		Revus	500 mL/ha	12 hours	14 days	Use with a non-ionic adjuvant at 0.125% v/v (1.25 L/1,000 L water). See Table 4–5. <i>Adjuvants Used in Ontario</i> , page 243. Do not use Revus plus adjuvant tank-mixed with sulphur on sulphur-sensitive varieties. This product is locally systemic.
	40+45	Zampro	0.8–1.0 L/ha	12 hours ¹ /12 days ²	14 days	Do not use less than 200 L water/ha. This product is fully systemic and will redistribute to young leaves as they develop.
46	Timorex Gold *	3.0 L/ha	4 hours	2 days	Suppression only. Do not tank-mix or alternate with Supra Captan, Maestro or sulphur products. See label for precautions on compatibility.	
Immediate prebloom						
Erineum mite	Use one of the products listed for Erineum mite at 3–5 leaves unfolded, 10–15-cm shoot length.					

¹ General re-entry. ² Hand labour (e.g., training, thinning, leaf pulling, hand harvest). ³ Preharvest interval is 1 day for table grapes or 21 days for wine grapes.

⁴ Check with processor and winery for wine grapes. ⁵ Preharvest interval is 14 days for table grapes. ⁶ Preharvest interval for mechanical harvest / hand harvest.

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Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Immediate prebloom						
Japanese beetle	General Comments: - Japanese beetle is a sporadic pest in Ontario. - Monitor presence and extent of feeding damage. Where damage is localized, spot treatment may be adequate.					
	1	Imidan WP	1.36 kg/ha	14 days ¹ /30 days ²	14 days	No product specific comments.
	4	Assail 70 WP	80 g/ha	12 hours ¹ /5 days ²	3 days/5 days ⁶	No product specific comments.
	28	Altacor	285 g/ha	12 hours	14 days	Suppression only. Apply when feeding is first observed and reapply in 10–14 days, if needed.
Leafhoppers	General Comments: Grape leafhopper, potato leafhopper, three-banded leafhopper and Virginia creeper leafhopper are the main species of leafhoppers that feed on grapes.					
	3	Ambush 500 EC or Perm-Up EC or Pounce 384 EC	140 mL/ha 175 mL/ha 175 mL/ha	when dry	7 days 21 days 21 days	No product specific comments.
		Pyganic EC 1.4 II *	2.32–4.65 L/ha	12 hours	—	Apply when pests are first observed. Do not wait until plants are heavily infested. Reapply if necessary after 7 days. For best results, use high rate, adjust spray solution to pH of 5.5–7.0, and apply promptly after mixing. If possible, apply in the early morning or evening hours. Before making widespread applications, treat a small area and observe for phytotoxicity over a 10-day period.
		Up-Cyde 2.5 EC	240 mL/ha	12 hours	7 days	No product specific comments.
	4A	Admire 240 Flowable	200 mL/ha	24 hours	0 days	No product specific comments.
		Assail 70 WP	80 g/ha	12 hours ¹ /5 days ²	3 days/5 days ⁶	No product specific comments.
		Clutch 50 WDG	100–140 g/ha	12 hours	1 day	No product specific comments.
	4C	Closer	200–240 mL/ha	12 hours	7 days	Suppression only. Where possible, rotate with products outside of Group 4.
	4D	Sivanto Prime	500–750 mL/ha	12 hours	0 days	Where possible, rotate with products outside of Group 4.
	NC	Surround WP *	50 kg/ha	12 hours	0 days	Apply at first sign of leafhoppers. Use 50 kg/ha for the initial 2 applications to establish the protectant layer, followed by 25 kg/ha in subsequent sprays. Light to moderate rain will help distribute product. Reapply after heavy rain, strong wind or overhead irrigation. Do not use with anti-foaming agents, spreader/stickers or oil. Closely monitor harvest parameters to determine best time to harvest. Do not apply postbloom on table grapes.

¹ General re-entry. ² Hand labour (e.g., training, thinning, leaf pulling, hand harvest). ³ Preharvest interval is 1 day for table grapes or 21 days for wine grapes.

⁴ Check with processor and winery for wine grapes. ⁵ Preharvest interval is 14 days for table grapes. ⁶ Preharvest interval for mechanical harvest / hand harvest.

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Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Immediate prebloom						
Phylloxera (leaf form)	4A	Assail 70 WP	80 g/ha	12 hours ¹ /5 days ²	3 days/5 days ⁶	No product specific comments.
		Clutch 50 WDG	140–210 g/ha	12 hours	1 day	No product specific comments.
	23	Movento 240 SC	365 mL/ha	12 hours	7 days	Will redistribute to young leaves as they develop. Control may not be apparent for 2–3 weeks. Consecutive applications should be at least 30 days apart. Tank-mix with an adjuvant/additive having spreading and penetrating properties at a suggested rate of 0.2% v/v (2L/1,000 L water). See label and Table 4–5. <i>Adjuvants Used in Ontario</i> , page 243, for further details. Do not use on table grapes.
Mealy bug, Scale	23	Movento 240 SC	365–585 mL/ha	12 hours	7 days	This timing is appropriate if phylloxera is a problem in the vineyard. Suppression only for scale. If grape leafroll-associated virus has been confirmed by an accredited lab and mealy bugs or scale has been confirmed in the vineyard, this spray may reduce insect vector pressure and spread of the virus. Reapply 30 days later. Tank-mix with a non-ionic surfactant at 0.2% v/v (2 L/1,000 L water). See label and Table 4–5. <i>Adjuvants Used in Ontario</i> , page 243, for further details. Do not apply to table grapes.
Trace bloom (first cap fall)						
DO NOT APPLY INSECTICIDES WHILE GRAPES ARE IN BLOOM. SEE BEE POISONING, PAGE 5.						
Black rot	Use one of the products listed for Black rot at Shoot length 20–25 cm . Fruit clusters are highly susceptible to black rot from bloom to 4 weeks postbloom. Apply at 7–10-day intervals to protect expanding leaves and developing fruit clusters. Apply at shorter intervals if weather is conducive to disease.					
Anthrachnose	Use one of the products listed for Anthracnose at 3–5 leaves unfolded, 10–15-cm shoot length .					
Downy mildew	Use one of the products listed for Downy mildew at Shoot length 20–25 cm . Rotate among groups for resistance management. Fruit clusters are very susceptible to infection by powdery mildew from bloom to 4–6 weeks postbloom. Unless otherwise indicated, spray at 7–10-day intervals to protect developing leaves and fruit clusters. Spray at 7-day intervals if weather is conducive to disease, unless otherwise specified on label.					
Powdery mildew	Use one of the products listed for Powdery mildew at Shoot length 20–25 cm . Rotate among fungicide groups for resistance management. Fruit clusters are very susceptible to infection by powdery mildew from bloom to 4–6 weeks postbloom. Unless otherwise indicated, spray at 7–10-day intervals to protect developing leaves and fruit clusters. Spray at 7-day intervals if weather is conducive to disease, unless otherwise specified on label.					
Botrytis bunch rot	General Comments: - If the bloom/postbloom period is wet, spray immediately to control latent infections in susceptible varieties (Baco Noir, Foch, Gamay Noir, Pinot Noir, Pinot Gris, Riesling, Chardonnay, Gewurztraminer, Sauvignon Blanc and Seyval Blanc). Direct this spray at the fruiting zone. - Group 2, 3, 7, 9, 11 and 17 fungicides are locally systemic. Consult labels for information on drying time required before rain.					
	M	Fracture	1.7–3.3 L/ha	when dry	0 days	Suppression only. Use high rate for high disease pressure. Do not mix with foliar fertilizers.

¹ General re-entry. ² Hand labour (e.g., training, thinning, leaf pulling, hand harvest). ³ Preharvest interval is 1 day for table grapes or 21 days for wine grapes.

⁴ Check with processor and winery for wine grapes. ⁵ Preharvest interval is 14 days for table grapes. ⁶ Preharvest interval for mechanical harvest / hand harvest.

— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Trace bloom (first cap fall)						
DO NOT APPLY INSECTICIDES WHILE GRAPES ARE IN BLOOM. SEE BEE POISONING, PAGE 5.						
Botrytis bunch rot (cont'd)	2	Rovral WP	1.5 kg/ha	12 hours	before bunch closure ⁴	Do not use after bunch closure.
	3+9	Inspire Super	1.03–1.48 L/ha	7 days	14 days	May cause damage to Concord.
	7	Kenja 400 SC	1.46–1.61 L/ha	12 hours	14 days	No product specific comments.
	7+9	Luna Tranquility	1.2 L/ha	12 hours ¹ / 24 hours ²	7 days	No product specific comments.
	7+11	Pristine WG	420–735 g/ha	when dry ¹ /21 days ²	14 days	Suppression only.
	9	Scala SC	2 L/ha	12 hours ¹ / 24 hours ²	7 days	No product specific comments.
	9+12	Switch 62.5 WG	775–975 g/ha	12 hours ¹ / 48 hours ²	7 days	No product specific comments.
	11	Intuity	439–877 mL/ha	12 hours	10 days	Do not use surfactants containing organosilicone.
	17	Elevate 50 WDG	1.12 kg/ha	4 hours	7 days	No product specific comments.
	44	Double Nickel LC *	3.0–6.25 L/ha	when dry	0 days	Suppression only. Under high disease pressure, use 6.25–25 L/ha
		Serenade OPTI *	1.7–3.3 kg/ha	when dry	0 days	Suppression only.
	NC	Botector *	400 g/ha in 400 L water	4 hours	0 days	Suppression only. Not compatible with some fungicides, such as Flint, Kumulus and Switch. See www.bio-ferm.com for product compatibilities. For products that are not compatible, keep a 3-day interval before and after application. Avoid application when heavy rain is forecast.
	P5	Regalia Maxx *	0.25% v/v in 500 L water	when dry	0 days	Suppression only. Apply before symptoms develop. Use 0.25% (1.25 L in 500 L water) in rotation with other fungicides.
Immediate postbloom to early fruit set						
Leafhoppers	Use one of the products listed for Leafhoppers at Immediate prebloom . Surround may reduce Brix accumulation.					
Japanese beetle	Use one of the products listed for Japanese beetle at Immediate prebloom .					
Phylloxera (leaf form)	Use one of the products listed for Phylloxera at Immediate prebloom . Do not apply Movento within 30 days of first application.					

¹ General re-entry. ² Hand labour (e.g., training, thinning, leaf pulling, hand harvest). ³ Preharvest interval is 1 day for table grapes or 21 days for wine grapes.
⁴ Check with processor and winery for wine grapes. ⁵ Preharvest interval is 14 days for table grapes. ⁶ Preharvest interval for mechanical harvest / hand harvest.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Immediate postbloom to early fruit set						
Mealy bug, Scale	23	Movento 240 SC	365–585 mL/ha	12 hours	7 days	This is the preferred timing if phylloxera is not a problem in the vineyard. Suppression only for scale. If grape leafroll-associated virus has been confirmed by an accredited lab and mealy bugs or scale has been confirmed in the vineyard, this spray may reduce insect vector pressure and spread of the virus. Reapply 30 days later. Tank-mix with a non-ionic surfactant at 0.2% v/v (2 L/1,000 L water). See label and Table 4–5. <i>Adjuvants Used in Ontario</i> , page 243 for further details. Do not apply to table grapes.
Black rot	Use one of the products listed for Black rot at Shoot length 20–25 cm . Fruit clusters are highly susceptible to black rot from bloom to 4 weeks postbloom. Apply at 7–10-day intervals to protect expanding leaves and developing fruit clusters. Apply at shorter intervals if weather is conducive to disease unless otherwise specified on label.					
Powdery mildew	Use one of the products listed for Powdery mildew at Shoot length 20–25 cm . Rotate among fungicide groups for resistance management. Fruit clusters are highly susceptible to powdery mildew from bloom to 4–6 weeks postbloom. Unless otherwise indicated, spray at 7–10-day intervals to protect developing leaves and fruit clusters. Spray at 7-day intervals if weather is conducive to disease unless otherwise specified on label.					
Downy mildew	Use one of the products listed for Downy mildew at Shoot length 20–25 cm . Rotate among fungicide groups for resistance management. Fruit clusters are highly susceptible to downy mildew until 4–6 weeks after bloom. Unless otherwise indicated, spray at 7–10-day intervals to protect developing leaves and fruit clusters. Spray at 7-day intervals if weather is conducive to disease unless otherwise specified on label.					
Botrytis bunch rot	Apply if a Botrytis spray was not applied at Trace bloom . Rotate among fungicide groups for resistance management. If the bloom/postbloom period is wet, spray immediately to control latent infections in susceptible varieties (Baco Noir, Foch Gamay Noir, Pinot Noir, Pinot Gris, Riesling, Chardonnay, Gewurztraminer, Sauvignon Blanc and Seyval Blanc). Direct this spray at the fruiting zone.					
Berries pea-sized						
Grape berry moth (second generation)	General Comments: • Where mating disruption is in place and monitoring indicates good control, an insecticide is not needed at this time. • Where there is a history of damage, apply at the appropriate timing listed in product specific comments below. Reapply if flight is extended. • Direct spray at the fruiting zone.					
	1	Imidan WP	2.2 kg/ha	14 days ¹ /30 days ²	14 days	Apply at upswing in moth numbers caught in pheromone traps.
	3	Ambush 500 EC or Perm-Up EC or Pounce 384 EC	275 mL/ha 360 mL/ha 360 mL/ha	when dry	7 days 21 days 21 days	Apply at upswing in moth numbers caught in pheromone traps.
		Up-Cyde 2.5 EC	240 mL/ha	12 hours	7 days	
	5	Delegate	280 g/ha	12 hours	7 days	Apply at first sustained trap catch.
		Entrust * or Success	364 mL/ha 182 mL/ha	when dry ¹ /7 days ²	7 days	Suppression only. Apply at first sustained trap catch.

¹ General re-entry. ² Hand labour (e.g., training, thinning, leaf pulling, hand harvest). ³ Preharvest interval is 1 day for table grapes or 21 days for wine grapes.

⁴ Check with processor and winery for wine grapes. ⁵ Preharvest interval is 14 days for table grapes. ⁶ Preharvest interval for mechanical harvest / hand harvest.

— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Berries pea-sized						
Grape berry moth (second generation) (cont'd)	11	BioProtec CAF * or Dipel 2X DF *	2.8 L/ha 1.125 kg/ha	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage on both sides of the leaf. Apply at first sustained trap catch. Reapply 7–10 days later, if needed. Acidify spray mix to below pH 7.0 and apply on cloudy days or in the evening.
	18	Intrepid	600 mL/ha	12 hours	30 days	Apply at first sustained trap catch.
	28	Altacor	285 g/ha	12 hours	14 days	Apply at first sustained trap catch.
Japanese beetle	Use one of the products listed for Japanese beetle at Immediate prebloom .					
Mealy bug, Scale	Use one of the products listed for Mealy bug at Immediate prebloom . Do not apply Movento within 30 days of first application.					
Phylloxera (leaf form)	Use one of the products listed for Phylloxera at Immediate prebloom .					
Powdery mildew	Use one of the products listed for Powdery mildew at Shoot length 20-25 cm . Rotate among fungicide groups for resistance management. Fruit clusters are highly susceptible to powdery mildew from bloom to 4–6 weeks postbloom. Unless otherwise indicated, spray at 7–10-day intervals to protect developing leaves and fruit clusters. Spray at 7-day intervals if weather is conducive to disease. Increase rate of Microscopic Sulphur to 6 kg/1,000 L water. Purespray Green Spray Oil may remove the waxy bloom on grape berries.					
Downy mildew	Use one of the products listed for Downy mildew at Shoot length 20–25 cm . Rotate among fungicide groups for resistance management. Fruit clusters are highly susceptible to downy mildew until 4–6 weeks postbloom. Unless otherwise indicated, spray at 7–10-day intervals to protect developing leaves and fruit clusters. Spray at 7-day intervals if weather is conducive to disease.					
Black rot	Use one of the products listed for Black rot at Shoot length 20–25 cm . Fruit clusters are highly susceptible to black rot from bloom to 4 weeks postbloom.					
Berry touch to cluster closure Check product labels and Table 4–1. <i>Products Used on Grapes</i> , page 232, for preharvest intervals.						
European red mite, Two-spotted spider mite	General Comments: • Monitor where there has been a history of mite damage. • Apply a miticide when 3–5 mites are found per mid-shoot leaf. Thorough spray coverage is essential for good control. • For resistance management, do not use any product more than once per season. • Two spotted spider mite is a problem only in very hot, dry growing seasons when cover crops die off.					
	6	Agri-Mek SC	130–265 mL/ha	12 hours ¹ /13 days ²	28 days	Apply when mites first appear. Use low rate for low to moderate infestations and high rate for severe infestations. Use with a non-ionic surfactant in a minimum of 470 L of water/ha. See Table 4–5. <i>Adjuvants Used in Ontario</i> , page 243. Do not apply within 10 days of Supra Captan, Maestro or Folpan. Monitor and evaluate control 7–10 days after application.
	21	Nexter	300 g/ha	24 hours	25 days	Effective against nymphs only.

¹ General re-entry. ² Hand labour (e.g., training, thinning, leaf pulling, hand harvest). ³ Preharvest interval is 1 day for table grapes or 21 days for wine grapes.

⁴ Check with processor and winery for wine grapes. ⁵ Preharvest interval is 14 days for table grapes. ⁶ Preharvest interval for mechanical harvest / hand harvest.

— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Berry touch to cluster closure Check product labels and Table 4–1. <i>Products Used on Grapes</i> , page 232, for preharvest intervals.						
European red mite, Two-spotted spider mite (cont'd)	23	Envirdor 240 SC	750 mL/ha	12 hours	14 days	Control may not be apparent for 2–3 weeks. Active on all life stages, including eggs, nymphs and adults.
	25	Nealta	1 L/ha	12 hours	14 days	Provides knock-down and residual control. The addition of a surfactant registered on the crop may improve activity. Active on all life stages, including eggs, nymphs and adults.
	UN	Acramite 50 WS	851 g/ha	12 hours ¹ /24 hours ²	14 days	If two-spotted spider mite is a problem, use 567 g/ha.
	NC	Vegol Crop Oil *	2% v/v	12 hours	0 days	Suppression only. Apply in a high-volume spray to ensure thorough coverage at a rate of 2% v/v (20 L/1,000 L water). Tolerance has not been determined for all varieties. Test a small area of each variety prior to spraying the whole block. Do not use within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed vines. Do not apply to wet foliage. Do not use within 14 days of Supra Captan, Maestro, Folpan or copper and 30 days of sulphur.
Powdery mildew	Use one of the products listed for Powdery mildew at 3–5 leaves unfolded, 10–15-cm shoot length . Rotate among fungicide groups for resistance management. Fruit clusters are highly susceptible to powdery mildew from bloom to 4–6 weeks postbloom. Increase rate of Microscopic Sulphur to 6 kg/1,000 L water. Purespray Green Spray Oil and Vegol Crop Oil may remove the waxy bloom on grape berries.					
Downy mildew	Use one of the products listed for Downy mildew at Shoot length 20–25 cm . Rotate among fungicide groups for resistance management. Fruit clusters are highly susceptible to downy mildew until 4–6 weeks after bloom.					
Black rot	Use one of the products listed for Black rot at Shoot length 20–25 cm . This spray is necessary only if black rot is severe and new infections continue to occur.					
Botrytis bunch rot	Use one of the products listed for Botrytis bunch rot at Trace bloom , ensuring rotation among groups for resistance management. This is a critical spray for Botrytis bunch rot. Many of the vinifera and French hybrid varieties with tight clusters are susceptible to botrytis bunch rot (e.g., Baco Noir, Foch, Gamay Noir, Pinot Noir, Pinot Gris, Riesling, Chardonnay, Gewurztraminer, Sauvignon Blanc and Seyval Blanc). Direct spray at the fruiting zone. Ensure complete coverage of berries before clusters close. Do not use Rovral after cluster closure.					
Beginning of ripening (veraison) through harvest Check product labels and Table 4–1. <i>Products Used on Grapes</i> , page 232, for preharvest intervals.						
Grape berry moth (about mid to late August)	In blocks without mating disruption, use one of the products listed for Grape berry moth at Berries pea-sized . Rotate among insecticide groups between generations for resistance management. Border sprays of conventional insecticides may be very effective. Direct spray at fruiting zone. Where mating disruption is in place and monitoring indicates good control, an insecticide may not be needed at this time.					
Powdery mildew	Use one of the products listed for Powdery mildew at Shoot length 20-25 cm . Rotate among fungicide groups for resistance management. Foliage of vinifera and some French hybrid varieties are more susceptible and may require extra sprays. Increase rate of Microscopic Sulphur to 6 kg/1,000 L water. Purespray Green Spray Oil and Vegol Crop Oil may remove the waxy bloom on grape berries; not recommended for table grapes.					
Downy mildew	Use one of the products listed for Downy mildew at Shoot length 20–25 cm . Rotate among fungicide groups for resistance management. Foliage of vinifera and some French hybrid varieties are more susceptible and may require extra sprays.					

¹ General re-entry. ² Hand labour (e.g., training, thinning, leaf pulling, hand harvest). ³ Preharvest interval is 1 day for table grapes or 21 days for wine grapes.

⁴ Check with processor and winery for wine grapes. ⁵ Preharvest interval is 14 days for table grapes. ⁶ Preharvest interval for mechanical harvest / hand harvest.

— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Beginning of ripening (veraison) through harvest						
Check product labels and Table 4–1. <i>Products Used on Grapes</i> , page 232, for preharvest intervals.						
Botrytis bunch rot		Use one of the products listed for Botrytis bunch rot at Trace bloom . Rotate among fungicide groups for resistance management. Many of the vinifera and French hybrid varieties with tight clusters are susceptible to botrytis bunch rot (e.g., Baco Noir, Foch, Gamay Noir, Pinot Noir, Pinot Gris, Riesling, Chardonnay, Gewurztraminer, Sauvignon Blanc and Seyval Blanc). Direct spray at the fruiting zone. Do not use Rovral after cluster closure.				
Slug snail	NC	Sluggo Professional	25 kg/ha	12 hours	—	Apply 50 kg/ha if population is very high. Apply when infestation begins. Reapply as the bait is consumed or at least every 2 weeks if slugs and snails continue to be a problem.
Special sprays (when monitoring indicates the need)						
Multi-coloured Asian lady beetle	General Comments: - Lady beetles are not a problem until very close to harvest. Begin monitoring around mid-August and continue for each cultivar until harvested. - Early presence of lady beetles is not an immediate concern because they can arrive and leave an area rapidly. Discuss beetle thresholds and product restrictions with the proposed purchaser of grapes before taking action. Continue to monitor after treatment. - Re-infestation may occur before harvest.					
	1	Malathion 85 E	880 mL/ha	12 hours ¹ /4 days ²	3 days	No product specific comments.
	3	Mako	150 mL/ha	12 hours ¹ /6 days ²	2 days/6 days ⁶	Cannot be used on juice grapes destined for export to the United States. Do not use on table grapes
Yellow jacket wasps	3	Mako	150 mL/ha	12 hours ¹ /6 days ²	2 days/6 days ⁶	Cannot be used on juice grapes destined for export to the United States. Do not use on table grapes.
Spotted wing drosophila	3	Mako	150 mL/ha	12 hours ¹ /6 days ²	2 days/6 days ⁶	Spotted wing drosophila has not been identified as a significant pest of grapes in Ontario. Do not use on juice grapes destined for export to the United States or on table grapes. See Table 4–4. <i>Activity of Insecticides on Grape Insect Pests and Honeybees</i> , page 241, for other products that have activity on spotted wing drosophila.
Brown marmorated stink bug	General Comments: - Breeding populations of this pest are present in Ontario. Check ontario.ca/stinkbug for updates on pest development, registered products and management strategies. - There are currently no thresholds established. Apply when insects are first detected or early damage found.					
	4	Clutch 50 WDG	210 g/ha	12 hours	1 day	Suppression only. This product is toxic to beneficial insects and should be used only when necessary.
Botrytis bunch rot		Use one of the products listed for Botrytis bunch rot at Trace bloom . Rotate among fungicide groups for resistance management. This spray is necessary for tight-clustered, thin-skinned varieties. If conditions are warm and wet through the preharvest period, a second spray may be needed. Direct this spray to the fruiting zone. Do not use Rovral after cluster closure.				

¹ General re-entry. ² Hand labour (e.g., training, thinning, leaf pulling, hand harvest). ³ Preharvest interval is 1 day for table grapes or 21 days for wine grapes.

⁴ Check with processor and winery for wine grapes. ⁵ Preharvest interval is 14 days for table grapes. ⁶ Preharvest interval for mechanical harvest / hand harvest.

— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Preharvest Intervals

Contact the processors and wineries directly in regard to their preharvest interval policy. Preharvest intervals listed in Table 4–1. *Products Used on Grapes*, on this page, are taken from product labels. In some cases, regulations on residues in finished products are much more stringent. Many processors require longer preharvest intervals than stated on product labels. Some processors and wineries also have special restrictions for certain pest control products regarding number of applications or application after a certain crop stage. Consult the grape purchaser for more details.

Table 4–1. Products Used on Grapes

Use this table as a guide, but refer to product label for specific information.

The **preharvest interval** is the number of days between the last spray and first harvest.

The **restricted entry interval** is the minimum interval that must be observed between the application of the pesticide and work in the treated crop without protective equipment. If no re-entry period is stated on the label, assume it is 12 hours.

The **maximum applications** is the labelled maximum number or product amount applied for the growing season and may be higher than what is recommended for resistance management or for the preservation of beneficial insects.

Products listed as **potentially organic** may be acceptable for organic use based on *Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec publication Bulletin D'Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with certifying body to verify the acceptability of any product prior to using it.

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
Products used for insect and mite control or suppression							
Acramite 50 WS	27925	bifenazate	UN	14 days	12 hours ¹ /24 hours ²	1	—
Admire 240 Flowable	24094	imidacloprid	4A	0 days	24 hours	2	—
Agri-Mek SC	31607	abamectin	6	28 days	12 hours ¹ /13 days ²	2	—
Altacor	28981	chlorantraniliprole	28	14 days	12 hours	3 (max. 645 g/ha)	—
Ambush 500 EC	14882	permethrin	3	7 days	when dry	—	—
Assail 70 WP	27128	acetamiprid	4A	3 days/5 days ³	12 hours ¹ /5 days ²	2	—
BioProtec CAF	26854	<i>Bacillus thuringiensis</i>	11	0 days	12 hours	6	✓
Closer	30826	sulfoxaflor	4C	7 days	12 hours	2	—
Clutch 50 WDG	29382	clothianidin	4A	1 day	12 hours	1 (max. 210 g/ha)	—
Delegate	28778	spinetoram	5	7 days	12 hours	3	—
Dipel 2X DF	26508	<i>Bacillus thuringiensis</i>	11	0 days	12 hours	6	✓
Entrust	30382	spinosad	5	7 days	when dry ¹ /7 days ²	3	✓
Envidor 240 SC	28051	spirodiclofen	23	14 days	12 hours	1	—
Imidan WP	29064	phosmet	1B	14 days	14 days ¹ /30 days ²	3	—

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Plant extract.

U/UN = Mode of action has not been determined. — = Information is not specified on the product label. ✓ = Potentially organic. Check with certifying body.

¹ General re-entry. ² Hand labour (e.g., training, thinning, leaf pulling, hand harvest). ³ Preharvest interval for mechanical harvest / hand harvest. ⁴ Maximum 3 applications per year for mechanical harvest or 2 applications for hand harvest. ⁵ Check with processor and winery for wine grapes. ⁶ Preharvest interval is 14 days for table grapes. ⁷ Maximum 6 applications per season with no more than 2 dormant applications. ⁸ Preharvest interval is 1 day for table grapes or 21 days for wine grapes. ⁹ Depends on rate. See label. ¹⁰ For use on wine grapes only.

Table 4–1. Products Used on Grapes (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
Products used for insect and mite control or suppression							
Intrepid	27786	methoxyfenozide	18	30 days	12 hours	3	—
Isomate-GBM Plus	27525	pheromone, grape berry moth	NC	—	—	1	✓
Kopa	31433	potassium salts of fatty acids	NC	0 days	12 hours	—	✓
Lime Sulphur	16465	calcium polysulphide	UN	120 days	48 hours	1 (delayed dormant)	✓
Malathion 85 E	8372	malathion	1B	3 days	12 hours ¹ /4 days ²	1	—
Mako ¹⁰	30316	cypermethrin	3	2 days/6 days ³	12 hours ¹ /6 days ²	3/2 ⁴	—
Movento 240 SC	28953	spirotetramat	23	7 days	12 hours	2 (max. 920 mL/ha)	—
Nealta	31284	cyflumetofen	25	14 days	12 hours	2	—
Nexter	25135	pyridaben	21	25 days	24 hours	1	—
Opal	28146	potassium salts of fatty acids	NC	0 days	12 hours	—	✓
Perm-Up EC	28877	permethrin	3	21 days	12 hours	2	—
Pounce 384 EC	16688	permethrin	3	21 days	when dry	2	—
Purespray Green Spray Oil 13 E	27666	mineral oil	NC	14 days ^{5,6}	12 hours	8 (summer)	✓
Pyganic EC 1.4 II	30164	pyrethrins	3	—	12 hours	8	✓
Sivanto Prime	31452	flupyradifurone	4D	0 days	12 hours	max. 2 L/ha	—
Sluggo Professional	30025	ferric phosphate	NC	—	12 hours	—	—
Success	26835	spinosad	5	7 days	when dry ¹ /7 days ²	3	—
Surround WP	27469	kaolin	NC	0 days	12 hours	—	✓
Up-Cyde 2.5 EC	28795	cypermethrin	3	7 days	12 hours	3	—
Vegol Crop Oil	32408	canola oil	NC	0 days	12 hours	2/4 ⁷	✓
Products used for disease control or suppression							
Actinovate SP	28672	<i>Streptomyces lydicus</i>	NC	—	when dry	—	✓
Aliette	27688	fosetyl-al	33	15 days	6 days	7	—
Aprovia Top 195 EC	31526	difenoconazole + benzovindiflupyr	3+7	21 days	48 hours	max. 3.9 L/ha	—
Botector	31248	<i>Aureobasidium pullulans</i>	NC	0 days	4 hours	4	✓
Buran	30601	garlic powder	NC	0 days	when dry	—	✓
Cantus WDG	30141	boscalid	7	14 days	12 hours	5	—
Confine Extra	30648	mono- and di-basic salts of phosphorus acid	33	1 day	12 hours	9	—

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Plant extract.

U/UN = Mode of action has not been determined. — = Information is not specified on the product label. ✓ = Potentially organic. Check with certifying body.

¹ General re-entry. ² Hand labour (e.g., training, thinning, leaf pulling, hand harvest). ³ Preharvest interval for mechanical harvest / hand harvest. ⁴ Maximum 3 applications per year for mechanical harvest or 2 applications for hand harvest. ⁵ Check with processor and winery for wine grapes. ⁶ Preharvest interval is 14 days for table grapes. ⁷ Maximum 6 applications per season with no more than 2 dormant applications. ⁸ Preharvest interval is 1 day for table grapes or 21 days for wine grapes. ⁹ Depends on rate. See label. ¹⁰ For use on wine grapes only.

Table 4–1. Products Used on Grapes (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
Products used for disease control or suppression							
Copper 53 W	9934	tri-basic copper sulphate	M	2 days ⁵	48 hours	7	✓
Copper Spray	19146	copper oxychloride	M	2 days ⁵	48 hours	7	✓
Cosavet DF Edge	31869	sulphur	M	1 day/21 days ⁸	24 hours	8	✓
Cueva	31825	copper octanoate	M	1 day	4 hours	15	—
Dithane Rainshield	20553	mancozeb	M	30 days	12 hours	1 (prebloom) 3 (postbloom)	—
Double Nickel LC	31887	<i>Bacillus amyloliquefaciens</i>	44	0 days	when dry	—	✓
Elevate 50 WDG	25900	fenhexamid	17	7 days	4 hours	3	—
Ferbam 76 WDG	20136	ferbam	M	7 days	12 hours	—	—
Flint	30619	trifloxystrobin	11	14 days	12 hours ¹ /5 days ²	4	—
Folpan 80 WDG	27733	folpet	M	1 day	24 hours	2	—
Forum	32026	dimethomorph	40	14 days	12 hours ¹ /12 days ²	4	—
Fracture	32139	BLAD polypeptide	M	0 days	when dry	5	—
Fullback 125 SC	31679	flutriafol	3	14 days	12 hours ¹ /7 days ²	2/3 ⁹	—
Gavel 75 DF	26842	zoxamide + mancozeb	22+M	66 days	48 hours	6	—
Guardman Copper Oxychloride 50	13245	copper oxychloride	M	2 days ⁵	48 hours	7	✓
Inspire Super	30827	difenoconazole + cyprodanil	3+9	14 days	7 days	2	—
Intuity	32288	mandestrobin	11	10 days	12 hours	3/4 ⁹	—
Kenja 400 SC	31758	isofetamid	7	14 days	12 hours	3	—
Kocide 2000	27348	copper hydroxide	M	2 days	48 hours	7	✓
Kumulus DF	18836	sulphur	M	1 day/21 days ⁸	24 hours	8	✓
Lime Sulphur	16465	calcium polysulphide	M	120 days	48 hours	1 (delayed dormant)	✓
Luna Tranquility	30510	fluopyram + pyrimethanil	7+9	7 days	12 hours ¹ /24 hours ²	2/3 ⁹	—
Maestro 80 DF	26408	captan	M	7 days	72 hours	—	—
Manzate Pro-Stick	28217	mancozeb	M	30 days	24 hours	4	—
Mettle 125 ME	30673	tetraconazole	3	15 days	12 hours ¹ /15 days ²	2	—
Microscopic Sulphur WP	14653	sulphur	M	1 day/21 days ⁸	24 hours	8	✓
Microthiol Disperss	29487	sulphur	M	1 day/21 days ⁸	24 hours	8	✓
MilStop	28095	potassium bicarbonate	NC	0 days	4 hours	10	✓

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Plant extract.

U/UN = Mode of action has not been determined. — = Information is not specified on the product label. ✓ = Potentially organic. Check with certifying body.

¹ General re-entry. ² Hand labour (e.g., training, thinning, leaf pulling, hand harvest). ³ Preharvest interval for mechanical harvest / hand harvest. ⁴ Maximum 3 applications per year for mechanical harvest or 2 applications for hand harvest. ⁵ Check with processor and winery for wine grapes. ⁶ Preharvest interval is 14 days for table grapes. ⁷ Maximum 6 applications per season with no more than 2 dormant applications. ⁸ Preharvest interval is 1 day for table grapes or 21 days for wine grapes. ⁹ Depends on rate. See label. ¹⁰ For use on wine grapes only.

Table 4–1. Products Used on Grapes (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
Products used for disease control or suppression							
Nova	22399	myclobutanil	3	14 days	12 hours ¹ /7 days ²	5	—
Penncozeb 75 DF Raincoat	30241	mancozeb	M	30 days	24 hours	4	—
Phostrol	30449	mono- and di-basic sodium, potassium and ammonium phosphites	33	0 days	12 hours	4	—
Polyram DF	20087	metiram	M	45 days	12 hours	3	—
Pristine WG	27985	boscalid + pyraclostrobin	7+11	14 days	when dry ¹ / 21 days ²	2/6 ⁹	—
Priwen ¹⁰	31959	spiroxamine	5	35 days	12 hours ¹ /17 days ²	2/3 ⁹	—
Property 300 SC	32534	pyriofenone	U8	0 days	12 hours	3/4 ⁹	—
Purespray Green Spray Oil 13 E	27666	mineral oil	NC	14 days ^{5,6}	12 hours	8 (summer)	✓
Quintec	29755	quinoxifen	13	14 days	12 hours	5	—
Rampart	30654	mono and dipotassium salts of phosphorous acid	33	1 day	4 hours	5	—
Regalia Maxx	30199	extract of <i>Reynoutria sachalinensis</i>	P5	0 days	when dry	—	✓
Revus	29074	mandipropamid	40	14 days	12 hours	4	—
Rovral	15213	iprodione	2	before bunch closure ⁵	12 hours	2	—
Ridomil Gold MZ 68 WG	28893	metalaxyl + mancozeb	4+M	66 days	24 hours	1 (prebloom) 1 (postbloom)	—
Scala SC	28011	pyrimethanil	9	7 days	12 hours ¹ /24 hours ²	3	—
Sercadis	31697	fluxapyroxad	7	14 days	12 hours	6	—
Serenade OPTI	31666	<i>Bacillus subtilis</i>	44	0 days	when dry	—	✓
Sirocco	31091	potassium bicarbonate	NC	0 days	4 hours	10	✓
Sovran	26257	kresoxim-methyl	11	14 days	48 hours	4	—
Supra Captan 80 WDG	24613	captan	M	7 days	72 hours	—	—
Switch 62.5 WG	28189	cyprodinil + fludioxonil	9+12	7 days	12 hours ¹ /48 hours ²	2	—
Timorex Gold	30910	tea tree oil	46	2 days	4 hours	—	✓
Tivano	30468	citric acid + lactic acid	NC	—	when dry	—	✓
Torrent 400 SC	30392	cyazofamid	21	30 days	12 hours	6	—
Vegol Crop Oil	32408	canola oil	NC	0 days	12 hours	2/4 ⁷	✓
Vivando SC	29765	metrafenone	U8	14 days	12 hours	6	—
Zampro	30321	ametoctradin + dimethomorph	40+45	14 days	12 hours ¹ /12 days ²	4	—

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Plant extract.

U/UN = Mode of action has not been determined. — = Information is not specified on the product label. ✓ = Potentially organic. Check with certifying body.

¹ General re-entry. ² Hand labour (e.g., training, thinning, leaf pulling, hand harvest). ³ Preharvest interval for mechanical harvest / hand harvest. ⁴ Maximum 3 applications per year for mechanical harvest or 2 applications for hand harvest. ⁵ Check with processor and winery for wine grapes. ⁶ Preharvest interval is 14 days for table grapes. ⁷ Maximum 6 applications per season with no more than 2 dormant applications. ⁸ Preharvest interval is 1 day for table grapes or 21 days for wine grapes. ⁹ Depends on rate. See label. ¹⁰ For use on wine grapes only.

Notes on Grape Pests

In this section:

- Table 4–2.** *Relative Susceptibility of Grape Cultivars to Diseases*, on this page.
Table 4–3. *Activity of Fungicides on Grape Diseases and Impact on Honeybees*, page 238.
Table 4–4. *Activity of Insecticides on Grape Insect Pests and Impact on Honeybees*, page 241.

Table 4–2. Relative Susceptibility of Grape Cultivars to Diseases^A

Cultivar	Phomopsis cane blight	Black rot	Downy mildew	Powdery mildew	Botrytis bunch rot	Phytotoxic chemical sensitivity
Vinifera wine^B						
Auxerrois	MS	MS	MS	HS	HS	—
Cabernet Franc	MS	HS	MS	HS	SS	—
Cabernet Sauvignon	MS	HS	MS	HS	SS	—
Chardonnay	MS	HS	ES	ES	HS	—
Gamay	SS	MS	MS	HS	MS	—
Gewurztraminer	SS	HS	MS	HS	HS	—
Merlot	SS	HS	MS	HS	MS	2
Pinot Blanc	UN	HS	MS	HS	HS	—
Pinot Gris	SS	HS	MS	HS	HS	—
Pinot Noir	SS	HS	MS	HS	HS	—
Riesling	SS	HS	MS	HS	HS	—
Sauvignon Blanc	SS	MS	MS	MS	HS	—
Zweigeltrebe	MS	HS	MS	HS	SS	—

UN = Relative susceptibility is unknown. R = Resistant. SS = Slightly susceptible. MS = Moderately susceptible. HS = Highly susceptible. ES = Extremely susceptible. L = Leaves. F = Fruit.

^A These notes are based on based on observations in Ontario and northeast United States under average conditions. Under adverse weather conditions, such as extended cool weather, any given variety may be more seriously affected.

^B Vinifera varieties not included in this chart are considered susceptible to powdery mildew, downy mildew and black rot.

^C Based on ratings in from D. Jones, Michigan State University and P McManus, Minnesota State University (pers comm).

^D All juice and table varieties are Labrusca species, with exception of Himrod (American hybrid).

1 = Sulphur-sensitive. 2 = Copper-sensitive. 3 = Flint- and Pristine-sensitive. 4= Inspire Super-sensitive. — = No chemical sensitivity has been observed. † No more than 2 apps/season.

Table 4–2. Relative Susceptibility of Grape Cultivars to Diseases^A (cont'd)

Cultivar	Phomopsis cane blight	Black rot	Downy mildew	Powdery mildew	Botrytis bunch rot	Phytotoxic chemical sensitivity
French hybrid wine						
Baco Noir	MS	SS	SS	MS	HS	1
Chambourcin	SS	MS	MS	MS	SS	1
De Chaunac	HS	SS	SS	MS	SS	1
Marechal Foch	MS	SS	SS	MS	SS	1
Seyval Blanc	MS	MS	MS	HS	HS	—
S.V. 23-512	SS	SS	MS	MS	SS	—
Vidal 256	SS	SS	MS	MS	HS	2
American hybrid wine^C						
Frontenac	SS	MS (L) / HS (F)	SS (L) / R (F)	MS	SS	2 [†]
Frontenac gris	SS	MS (L) / HS (F)	SS (L) / R (F)	MS	SS	2 [†]
La Crescent	SS	SS (L) / R (F)	HS (L) / R (F)	SS	SS	1 [†]
Marquette	SS	MS (L) / HS (F)	SS (L) / R (F)	HS	SS	2 [†]
St. Croix	HS	SS (L) / SS (F)	HS (L) / R (F)	SS	SS	1, 2 [†]
Juice and table grapes^D						
Concord	MS	MS	MS	MS	SS	1, 2, 3, 4
Elvira	HS	MS	SS	MS	MS	3
Fredonia	MS	MS	HS	MS	SS	3
Himrod	SS	MS	SS	MS	MS	—
Niagara	MS	HS	HS	MS	SS	2
N.Y. Muscat	SS	SS	SS	MS	SS	—
Sovereign Coronation	SS	SS	HS	HS	MS	—

UN = Relative susceptibility is unknown. R = Resistant. SS = Slightly susceptible. MS = Moderately susceptible. HS = Highly susceptible. ES = Extremely susceptible. L = Leaves. F = Fruit.

^A These notes are based on observations in Ontario and northeast United States under average conditions. Under adverse weather conditions, such as extended cool weather, any given variety may be more seriously affected.

^B Vinifera varieties not included in this chart are considered susceptible to powdery mildew, downy mildew and black rot.

^C Based on ratings in from D. Jones, Michigan State University and P McManus, Minnesota State University (pers comm).

^D All juice and table varieties are Labrusca species, with exception of Himrod (American hybrid).

1 = Sulphur-sensitive. 2 = Copper-sensitive. 3 = Flint- and Pristine-sensitive. 4= Inspire Super-sensitive. — = No chemical sensitivity has been observed. [†]No more than 2 apps/season.

Table 4–3. Activity of Fungicides on Grape Diseases and Impact on Honeybees

See the product label or crop calendars for registered uses. Use fungicides only for diseases listed on the product label for the crop. The information provided in this table is based on information from other areas. It is intended to assist the grower in choosing the best fungicide for control of pests listed on the product label, while managing resistance and avoiding unnecessary sprays for non-target pests. Efficacy can be affected by rate of the product.

Group	Fungicide	Anthraco	Phomopsis cane and leaf spot	Black rot	Downy mildew	Powdery mildew	Botrytis bunch rot	Honeybee Toxicity ¹	Activity
M	Copper 53 W	0	1 *	1 *	3 *	2	0	MT	Contact
M	Copper Spray	0	1	1	2 *	2 *	0	NT	Contact
M	Cosavet DF Edge	1	1	0	0	3 *	0	NT	Contact
M	Cueva	0	1	1	2 *	2 *	0	NT	Contact
M	Dithane Rainshield	2	3	3 *	3 *	0	0	NT	Contact
M	Ferbam 76 WDG	2	3	3 *	2	0	0	NT	Contact
M	Folpan 80 WDG	2	3 *	1 *	3 *	0	0	NT	Contact
M	Fracture	0	0	0	0	1 *	1 *	NT	Contact
M	Guardsman Copper Oxychloride 50	0	1 *	1	2 *	2 *	0	NT	Contact
M	Kocide 2000	0	1	0	2 *	2	0	NT	Contact
M	Kumulus DF	1	1	0	0	3 *	0	NT	Contact
M	Lime Sulphur	2	0	0	0	1 *	0	NT	Contact
M	Maestro 80 DF	2	3 *	1 *	3 *	0	0	MT	Contact
M	Manzate Pro-Stick	2	3	3 *	3 *	0	0	NT	Contact
M	Microscopic Sulphur	1	1	0	0	3 *	0	NT	Contact
M	Microthiol Disperss	1	1	0	0	3 *	0	NT	Contact
M	Penncozeb 75 DF Raincoat	2	3	3 *	3 *	0	0	NT	Contact
M	Supra Captan 80 WDG	2	3 *	1 *	3 *	0	0	MT	Contact

M = Multi-site fungicides. NC = Not classified by FRAC, or group not indicated on product label. P = Plant extract. U = Mode of action has not been determined.

MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.

NT = Relatively non-toxic to bees.

¹ Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

Contact = Stays on the surface of plant. Locally systemic = Moves into plant but does not move to other plant parts. Systemic = Moves into plant and to unsprayed plant parts as they develop.

Fungicide activity adapted from New York and Pennsylvania *Pest Management Guidelines for Grapes*.

0 = Ineffective. 1 = Slightly effective/suppression, not recommended for very susceptible varieties or at critical stages of infection. 2 = Moderately effective. 3 = Very effective.

— = No information is available. * (shaded area) = The disease is listed on the product label for control or suppression.

Table 4–3. Activity of Fungicides on Grape Diseases and Impact on Honeybees (cont'd)

Group	Fungicide	Anthraco	Phomopsis cane and leaf spot	Black rot	Downy mildew	Powdery mildew	Botrytis bunch rot	Honeybee Toxicity ¹	Activity
2	Rovral WP	0	0	0	0	0	2 *	NT	Locally systemic
3	Fullback 125 SC	0	0	3 *	0	3 *	0	MT	Locally systemic
3	Mettle 125 ME	3	0	3 *	0	3 *	0	NT	Locally systemic
3	Nova	3 *	0	3 *	0	3 *	0	NT	Locally systemic
3+7	Aprovia Top 195 EC	1	0	1	0	3 *	0	NT	Locally systemic
3+9	Inspire Super	3 *	0	3 *	0	3 *	3 *	NT	Locally systemic
4+M	Ridomil Gold MZ 68 WG	0	1	1	3 *	0	0	NT	Systemic
5	Priwen	0	0	0	0	3 *	0	NT	Locally systemic
7	Cantus WDG	0	0	0	0	3 *	1	NT	Locally systemic
7	Kenja 400 SC	0	0	0	0	2	3 *	NT	Locally systemic
7	Sercadis	0	0	0	0	3 *	1 *	NT	Locally systemic
7+9	Luna Tranquility	0	0	0	0	3 *	3 *	NT	Locally systemic
7+11	Pristine WG	3 *	1	3 *	3 *	3 *	1 *	NT	Locally systemic
9	Scala SC	0	0	0	0	0	3 *	NT	Locally systemic
9+12	Switch 62.5 WG	0	0	0	0	0	3 *	NT	Locally systemic
11	Flint	0	1	3 *	1	3 *	1	NT	Locally systemic
11	Intuity	0	0	0	0	3 *	0	NT	Locally systemic
11	Sovran	0	1	3 *	2 *	2 *	1	NT	Locally systemic
13	Quintec	0	0	0	0	3 *	0	MT	Locally systemic
17	Elevate 50 WDG	0	0	0	0	1	3 *	NT	Locally systemic
21	Torrent 400 SC	0	0	0	3 *	0	0	NT	Locally systemic
22	Gavel 75DF	0	0	0	3 *	0	0	NT	Contact
33	Aliette	0	0	0	3 *	0	0	NT	Systemic
33	Confine Extra	0	0	0	3 *	0	0	NT	Systemic

M = Multi-site fungicides. NC = Not classified by FRAC, or group not indicated on product label. P = Plant extract. U = Mode of action has not been determined.

MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.

NT = Relatively non-toxic to bees.

¹ Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

Contact = Stays on the surface of plant. Locally systemic = Moves into plant but does not move to other plant parts. Systemic = Moves into plant and to unsprayed plant parts as they develop.

Fungicide activity adapted from New York and Pennsylvania *Pest Management Guidelines for Grapes*.

0 = Ineffective. 1 = Slightly effective/suppression, not recommended for very susceptible varieties or at critical stages of infection. 2 = Moderately effective. 3 = Very effective.

— = No information is available. * (shaded area) = The disease is listed on the product label for control or suppression.

Table 4–3. Activity of Fungicides on Grape Diseases and Impact on Honeybees (cont'd)

Group	Fungicide	Anthraco	Phomopsis cane and leaf spot	Black rot	Downy mildew	Powdery mildew	Botrytis bunch rot	Honeybee Toxicity ¹	Activity
40	Forum	0	0	0	3 *	0	0	NT	Systemic
40	Revus	0	0	0	3 *	0	0	NT	Locally systemic
44	Double Nickel LC	0	0	0	0	1 *	1 *	NT	Contact
44	Serenade OPTI	0	0	0	0	1 *	2 *	NT	Contact
46	Timorex Gold	0	0	0	1 *	2 *	0	NT	Contact
40+45	Zampro	0	0	0	3 *	0	0	NT	Systemic
NC	Actinovate SP	—	—	—	—	2 *	1 *	NT	Contact
NC	Botector	0	0	0	0	0	1 *	NT	Contact
NC	Buran	0	0	0	0	1 *	0	NT	Contact
NC	MilStop	0	0	0	0	2 *	1	NT	Contact
NC	Purespray Green Spray Oil 13 E	0	0	0	0	2 *	0	—	Contact
NC	Sirocco	0	0	0	0	2 *	1	NT	Contact
NC	Tivano	0	0	0	1 *	0	0	NT	Contact
NC	Vegol Crop Oil	0	0	0	0	2 *	0	—	Contact
P5	Regalia Maxx	0	0	0	0	1 *	1 *	NT	Systemic
U8	Vivando SC	0	0	0	0	3 *	0	NT	Locally systemic

M = Multi-site fungicides. NC = Not classified by FRAC, or group not indicated on product label. P = Plant extract. U = Mode of action has not been determined.

MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.

NT = Relatively non-toxic to bees.

¹ Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

Contact = Stays on the surface of plant. Locally systemic = Moves into plant but does not move to other plant parts. Systemic = Moves into plant and to unsprayed plant parts as they develop.

Fungicide activity adapted from New York and Pennsylvania *Pest Management Guidelines for Grapes*.

0 = Ineffective. 1 = Slightly effective/suppression, not recommended for very susceptible varieties or at critical stages of infection. 2 = Moderately effective. 3 = Very effective.

— = No information is available. * (shaded area) = The disease is listed on the product label for control or suppression.

Table 4–4. Activity of Insecticides on Grape Insect Pests and Impact on Honeybees

Use insecticides only for insects listed on the product label for the crop. The information provided in this table is based on information from other areas. It is intended to assist the grower in choosing the best insecticide for control of pests listed on the product label, while managing resistance and avoiding unnecessary sprays for non-target pests. Efficacy can be affected by rate of the product.

Group	Product Name	Grape berry moth	Leafhoppers	Phylloxera	Japanese beetle	Erineum mite	MALB	Wasps	European red mite	Climbing cutworm	Flea beetle	Grape mealy bug	Scale	Spotted wing drosophila	Honeybee Toxicity ¹
1B	Imidan WP	3 *	3	—	2 *	—	—	—	—	—	1	—	2 exp	3	HT
1B	Malathion 85 E	1	2 *	—	—	—	3 *	3	2 *	—	—	2 *exp	2 *exp	3 *	HT
3	Ambush 500 EC	3 *	2 *	—	—	—	—	—	0	3	3	—	2 exp	2	HT
3	Mako	—	—	—	—	—	3 *	3 *	0	—	—	—	2 exp	2	HT
3	Perm-Up EC	3 *	2 *	—	2	—	—	—	0	3	3	—	2 exp	2	HT
3	Pounce 384 EC	3 *	2 *	—	2	—	—	—	0	3 *	3	—	2 exp	2	HT
3	Pyganic EC 1.4 II	2	2 *	—	1	—	—	—	0	—	—	—	—	2	HT
3	Up-Cyde 2.5 EC	3 *	2 *	—	—	—	—	—	0	—	—	—	2 exp	2	HT
4A	Admire 240 Flowable	—	3 *	2	—	—	—	—	0	—	—	2 exp	2 exp	2	HT
4A	Assail 70 WP	1 *	3 *	2 *	2 *	—	—	—	0	—	—	2 exp	2 exp	2	MT
4A	Clutch 50 WDG	—	3 *	2 *	—	—	—	—	0	—	2	2 *exp	2 exp	2	HT
4C	Closer	—	1 *	—	—	—	—	—	0	—	—	—	0	2	HT
4D	Sivanto Prime	—	3 *	—	—	—	—	—	—	—	—	—	—	—	MT
5	Delegate	3 *	—	—	—	—	—	—	0	3	2	—	0	3	HT
5	Entrust	2 *	—	—	—	—	—	—	0	—	2	—	0	2	HT
5	Success	2 *	—	—	—	—	—	—	0	—	2	—	0	3	HT
6	Agri-Mek SC	0	—	—	—	1	—	—	2 *	—	—	—	0	3	HT

NC = Not classified by IRAC, or group not indicated on product label. UN = Mode of action has not been determined.

HT = Highly toxic to bees. Severe losses may be expected if used when bees are present at treatment time or within a few days thereafter.

MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.

NT = Relatively non-toxic to bees.

I = Irritant. White film barrier on plant tissue may act as a repellent to bees when foraging.

¹ Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

² May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

Insecticide activity adapted from New York and Pennsylvania *Pest Management Guidelines for Grapes*, Michigan State University and BC Ministry of Agriculture recommendations, *Arthropod Management Tests*, and other sources.

0 = Ineffective. 1 = Slightly effective/suppression, not recommended for very susceptible varieties or at critical stages of infection. 2 = Moderately effective. 3 = Very effective.

— = No information is available. * (shaded area) = The pest is listed on the product label for control or suppression. exp = Works only on exposed early instars, not on any growth stage under bark.

Table 4–4. Activity of Insecticides on Grape Insect Pests and Impact on Honeybees (cont'd)

Group	Product Name	Grape berry moth	Leafhoppers	Phylloxera	Japanese beetle	Erineum mite	MALB	Wasps	European red mite	Climbing cutworm	Flea beetle	Grape mealy bug	Scale	Spotted wing drosophila	Honeybee Toxicity ¹
11	BioProtec CAF	2 *	0	0	0	0	0	0	0	—	0	0	0	3	NT
11	Dipel 2X DF	2 *	0	0	0	0	0	0	0	—	0	0	0	0	NT
18	Intrepid	3 *	—	—	—	—	—	—	0	3 *	—	—	0	0	NT
21	Nexter	0	0	0	0	1	0	0	2 *	0	0	0	0	0	HT
23	Envirdor 240 SC	0	0	0	0	—	0	0	3 *	0	0	—	0	0	MT
23	Movento 240 SC	0	—	3 *	0	2	0	0	—	0	0	3 *	1 *	0	HT ²
25	Nealta	0	0	0	0	0	0	0	3 *	0	0	0	0	0	NT
28	Altacor	3 *	—	—	1 *	0	—	—	0	3 *	—	—	0	0	NT
NC	Kopa	0	1	—	0	0	0	0	1 *	0	0	1 *exp	1 *exp	0	NT
NC	Kumulus DF	0	0	0	0	2 *	0	0	—	0	0	0	0	0	NT
NC	Lime Sulphur	—	—	—	—	2	—	—	—	—	—	1 exp	1 exp	0	NT
NC	Microthiol Disperss	0	0	0	0	2 *	0	0	—	0	0	0	0	0	NT
NC	Opal	0	1	—	0	0	0	0	1 *	0	0	1 *exp	1 *exp	0	NT
NC	Purespray Green Spray Oil 13 E	0	—	—	—	1 *	0	0	2 *	—	—	1 exp	1 exp	0	—
NC	Surround WP	—	2 *	—	1	—	—	—	—	—	1	—	0	0	I
NC	Vegol Crop Oil	—	1 *	1 *	—	1 *	—	—	2 *	—	—	1 *exp	1 *exp	—	—
UN	Acramite 50 WS	0	0	0	0	—	0	0	2 *	0	0	0	0	0	MT

NC = Not classified by IRAC, or group not indicated on product label. UN = Mode of action has not been determined.

HT = Highly toxic to bees. Severe losses may be expected if used when bees are present at treatment time or within a few days thereafter.

MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.

NT = Relatively non-toxic to bees.

I = Irritant. White film barrier on plant tissue may act as a repellent to bees when foraging.

¹ Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

² May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

Insecticide activity adapted from New York and Pennsylvania *Pest Management Guidelines for Grapes*, Michigan State University and BC Ministry of Agriculture recommendations, *Arthropod Management Tests*, and other sources.

0 = Ineffective. 1 = Slightly effective/suppression, not recommended for very susceptible varieties or at critical stages of infection. 2 = Moderately effective. 3 = Very effective.

— = No information is available. * (shaded area) = The pest is listed on the product label for control or suppression. exp = Works only on exposed early instars, not on any growth stage under bark.

Adjuvants Used in Fruit Crops

Spray adjuvants are tank-mix additives used to modify and enhance the effectiveness of the pesticide. They include surfactants, spreader/stickers, crop oils, anti-foaming agents, buffering agents, etc. Unless the product label specifies an adjuvant be added to the tank, growers do not need to use them.

A label may specify a particular name brand, or generalize a category of adjuvant. In the latter case, the grower is free to use any adjuvant in that category, provided it is registered for use on the crop. Always use adjuvants as directed on the product label. See Table 4–5. *Adjuvants Used in Ontario*, on this page, for common adjuvants used in fruit crops.

Table 4–5. Adjuvants Used in Ontario

Some pesticides used together or in close succession to crop oils or other adjuvants can cause crop injury. Do not use Supra Captan, Maestro, Folpan, Bravo, Echo or sulphur-based products with crop oils or adjuvants which are used to increase pesticide uptake. Crop safety issues can also occur around some formulations of copper or specific products, such as Group 11 fungicides. Read product labels closely for additional precautions around product compatibility with surfactants or crop oils. For more information on adjuvants, see sprayers101.com or Purdue Extension, *Adjuvants and the Power of the Spray* at ppp.purdue.edu/wp-content/uploads/2016/08/PPP-107.pdf.

Trade Name	Registration Number	Adjuvant Type	Characteristics
Agral 90	11809 24725	non-ionic surfactant	• wetter-spreader • compatible with most pesticides¹ • helps pesticide penetrate plant cuticle
Ipco Ag-Surf	15881	non-ionic surfactant	• wetter-spreader • compatible with most pesticides¹ • helps pesticide penetrate plant cuticle
LI 700	23026	non-ionic surfactant	• wetter-spreader • compatible with most pesticides¹ • helps pesticide penetrate plant cuticle • additional properties: pH adjuster, sticker
Purespray Green Spray Oil 13 E	27666	crop oil (mineral)	• helps pesticide penetrate plant cuticle or insect exoskeleton
Xiameter OFX-0309	23078	silicone surfactant (organosilicone)	• wetter-spreader • helps pesticide penetrate plant cuticle • reduces surface tension • improves rainfastness

¹ Check product label for precautions around surfactant compatibility before using.

APRICOT CALENDAR

In this section:

- Read the product label and follow all safety precautions. 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>.
- Consult the product label for suggested water volumes. Otherwise, use enough water to ensure thorough spray coverage. Where the product rate is listed in amount per 1,000 L, and if a water volume is not provided on the label, use enough water to wet the foliage to the near drip point.
- For preharvest interval, restricted entry interval, and maximum number of applications, see Table 5–1. *Products Used on Apricots*, page 255.
- **Products are listed by chemical group and in alphabetical order within each group. The order does not reflect efficacy.** See Table 5–7. *Activity of Fungicides on Tender Fruit Diseases and Impact on Honeybees*, page 340 and Table 5–8. *Activity of Insecticides and Miticides on Tender Fruit Pests and Impact on Honeybees*, page 343, for efficacy ratings.
- Where a product in the calendar is followed by a “*”, it is potentially acceptable for organic use based on *Ministère de l’Agriculture, des Pêcheries et de l’Alimentation du Québec publication Bulletin D’Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with your certifying body to verify the acceptability of any product prior to using it.

Resistance Management

To delay development of resistance to insecticides, miticides and fungicides, follow resistance management guidelines outlined in *Resistance Management Strategies*, page 393. The chemical group is indicated in the column labelled “Group” before the “Product” column. Products belonging to the same chemical group are grouped together in the calendar. Multi-site (M) fungicides are not prone to resistance and do not have to be rotated. Some products are not classified to mode of action (NC) and the mode of action has not been determined for others (U or UN). Group 44 and 46 fungicides are not known to be prone to resistance.

Fungicide resistance management

Take the following steps to avoid rapid development of fungicide resistance:

- Do not reduce rates below those specified on the label.
- Do not use products containing the same chemical group in consecutive applications.
- Do not use Rovral, Bumper, Fitness, Indar, Jade, Tilt, Quash, Cantus, Fontelis, Kenja, Sercadis or Pristine when sporulating lesions of brown rot are present.
- Do not exceed maximum number of applications on the label.

Insecticide resistance management

Take the following steps to avoid rapid development of insecticide resistance:

- For pests with discrete generations (oriental fruit moth, plum curculio and obliquebanded leafroller), do not use insecticides from the same group for more than one generation. Within a generation, if more than one spray is required, use a product from the same chemical group.
- For pests with overlapping generations (aphids, mites), do not use products containing the same chemical group in consecutive applications.
- Do not exceed maximum number of applications on the label.

Bee Toxicity

Some insecticides are toxic to bees and other pollinating insects. Use of insecticides on flowering crops requires careful management to avoid negative effects on pollinators. Some insecticides cannot be applied prior to or during bloom. Insecticides should not be applied when tree fruit are in bloom. Do not apply insecticides when bees are active. Before and after bloom, bees may be present on flowering cover crops and weeds—do not allow drift of insecticides onto these or other flowering crops. Always follow label precautions to avoid impacts on bees. For more information, see *Bee Poisoning*, page 5, and honeybee toxicity ratings in Table 5–7. *Activity of Fungicides on Tender Fruit Diseases and Impact on Honeybees*, page 340, and Table 5–8. *Activity of Insecticides and Miticides on Tender Fruit Pests and Impact on Honeybees*, page 343.

Buffer Zones

Leave a suitable buffer zone between treatment area and adjacent sensitive areas, such as hedgerows, woodlots and freshwater habitats. Zones may vary depending on the product used, growth stage of the crop and method of application including the use of drift-reducing technology. Check the pesticide label for requirements.

Use Health Canada’s online spray drift calculator to modify the buffer zone specified on the label based on weather conditions, category of spray equipment and 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. Unfortunately, this model does not account for carrier volume, travel speed or crop stage.

Observing buffer zones is a legal requirement. A record of the buffer zone modification, if any, must be retained for at least one year from the time of application.

Crop Nutrition

Crop nutrition is important for plant growth and fruit quality on berry crops. Soil testing, plant tissue analysis and visual deficiency symptoms all play an important role in assessing and monitoring the crop's nutritional status. For more information, visit http://www.omafra.gov.on.ca/english/crops/hort/tender_fruit.html (click on *Soil Management, Fertilizer Use, Crop Nutrition and Cover Crops for Fruit Production*) and see OMAFRA Publication 611, *Soil Fertility Handbook*. For soil testing and plant tissue analysis services, see Appendix E: *Accredited Soil-Testing Laboratories in Ontario*, page 435.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Dormant (in late March or early April before buds swell)						
European red mite	General Comments: • Apply in a high-volume spray to ensure thorough coverage. • Tolerance has not been determined for all varieties. Test a small area of each variety prior to spraying the whole block. • Do not use within 14 days of Supra Captan or Maestro. • Do not apply within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed trees.					
	NC	Purespray Green Spray Oil 13 E *	20 L/1,000 L water	12 hours	—	In addition to precautions in general comments, do not use within 14 days of sulphur.
		Superior 70 Oil *	20 L/1,000 L water	12 hours	prebloom	In addition to precautions in general comments, do not use within 30 days of sulphur.
		Vegol Crop Oil *	20 L/1,000 L water	12 hours	0 days	In addition to precautions in general comments, do not use within 14 days of copper and 30 days of sulphur. Do not apply to wet foliage.
Bacterial canker, Bacterial spot	M	Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	Apply in a high-volume spray to ensure thorough coverage. Do not mix with lime.
Scale	NC	Vegol Crop Oil *	20 L/1,000 L water	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage. Tolerance has not been determined for all varieties. Test a small area of each variety prior to spraying the whole block. Do not apply within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of Supra Captan, Maestro or copper and 30 days of sulphur. Do not apply to wet foliage.

¹ General re-entry. ² Hand thinning. ³ Harvest. ⁴ Maximum 6 applications per season with no more than 2 dormant applications. ⁵ No more than 2 applications in the 3 weeks prior to harvest.

⁶ Maximum 10 applications per season with no more than 2 dormant applications. — = Information is not specified on the product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Bloom						
DO NOT APPLY INSECTICIDES WHILE APRICOT TREES ARE IN BLOOM. SEE BEE POISONING, PAGE 5.						
Brown rot (blossom blight stage)	General Comments: • Apricots are extremely susceptible to brown rot. Knock off fruit mummies when pruning. • Spray when first blossoms open. If wet weather occurs, reapply spray at 50% bloom and at full bloom. • Group 2, 3, 7 and 11 fungicides are locally systemic. Consult labels for information on drying time required before rain.					
	M	Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	Do not mix with lime. May cause some defoliation. During excessive moisture and cold, leaf spots can appear on copper-sensitive crops. If concerned about tree sensitivity, test first on a small area.
		Fracture	1.5–3.3 L/ha	12 hours	0 days	Under high disease pressure, use high rate. Do not mix with foliar fertilizers.
		Maestro 80 DF or Supra Captan 80 WDG	4.5 kg/ha	48 hours	2 days	Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Fontelis or Exirel.
	2	Rovral WP	1.5 kg/ha	12 hours	1 day	No product specific comments.
	3	Bumper 432 EC or Fitness or Jade or Tilt 250 E	300 mL/ha 300 mL/ha 500 mL/ha 500 mL/ha	12 hours 72 hours 72 hours 72 hours	3 days	No product specific comments.
		Indar	140 g/ha	12 hours	1 day	No product specific comments.
		Quash	175–245 g/ha	12 hours ¹ /9 days ²	14 days	Under high disease pressure, use high rate.
	7	Cantus WDG	370 g/ha	12 hours	0 days	No product specific comments.
		Fontelis	1.0–1.75 L/ha	12 hours	0 days	Contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
		Kenja 400 SC	913 mL/ha	12 hours	1 day	Suppression only. Use with a silicone surfactant. See Table 5–9. <i>Adjuvants Used in Ontario</i> , page 346.
		Sercadis	333 mL/ha	12 hours	0 days	Use with a non-ionic surfactant at a rate of 0.125% v/v (1.25 L in 1,000 L water). See Table 5–9. <i>Adjuvants Used in Ontario</i> , page 346. Do not use after Petal fall .
	7+11	Pristine WG	750 g/ha	when dry ¹ / 24 hours ³ /10 days ²	1 day	No product specific comments.
	44	Serenade OPTI *	1.1–1.7 kg/ha	when dry	0 days	Suppression only.
	P5	Regalia Maxx *	0.125–0.25% v/v in 500–1,000 L water/ha	when dry	0 days	Suppression only. Apply before symptoms develop. Use 0.125% (1.25 L in 1,000 L water) in a tank-mix with other brown rot fungicides or 0.25% (2.5 L in 1,000 L water) in rotation with other brown rot fungicides.

¹ General re-entry. ² Hand thinning. ³ Harvest. ⁴ Maximum 6 applications per season with no more than 2 dormant applications. ⁵ No more than 2 applications in the 3 weeks prior to harvest.

⁶ Maximum 10 applications per season with no more than 2 dormant applications. — = Information is not specified on the product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Petal fall to Shuck						
Brown rot	Use one of the fungicides listed for Brown rot at Bloom . Quash rate is 175–280 g/ha for fruit rot. Do not use Sercadis after Petal fall .					
Scab	General Comments: Fungicides applied for brown rot may have some activity against scab. See Table 5–7. <i>Activity of Fungicides on Tender Fruit Diseases and Impact on Honeybees</i>, page 340.					
	7	Fontelis	1.0–1.5 L/ha	12 hours	0 days	Contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions. In orchards with a history of scab or under high disease pressure, use high rate and shorten intervals between applications
Bacterial spot	M	Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	Do not mix with lime. Reapply at 7–14-day intervals if weather is wet and warm. May cause some defoliation. During excessive moisture and cold, leaf spots can appear on copper-sensitive crops. If concerned about tree sensitivity, test first on a small area.
Oriental fruit moth	NC	Isomate OFM TT *	125–250 dispensers/ha	—	—	Reduces mating of oriental fruit moth. Apply dispensers in early April before flight begins. Place dispensers in lateral branches in the upper canopy, in a uniform manner across the orchard block. Use high rate for high pressure areas or initial year of treatment. Dispensers are designed to last for the entire season. For information on mating disruption, see OMAFRA Factsheet 03–079, <i>Mating Disruption for Management of Insect Pests</i> . If desired, use both an insecticide and mating disruptor for managing first-generation oriental fruit moth (see Shuck split). Apply supplemental control measures when conditions warrant.
Shuck split to Shuck fall						
Brown rot	Use one of the fungicides listed for Brown rot at Bloom . Apricots are extremely susceptible to brown rot from bloom through pit-hardening. Quash rate is 175–280 g/ha for fruit rot. Do not use Sercadis after Petal fall .					
Scab	Use one of the fungicides listed for Scab at Petal fall to Shuck . Fungicides applied for brown rot may have some activity against scab. See Table 5–7. <i>Activity of Fungicides on Tender Fruit Diseases and Impact on Honeybees</i> , page 340.					
Bacterial spot	M	Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	Do not mix with lime. Reapply at 7–14-day intervals if weather is wet and warm. May cause some defoliation. During excessive moisture and cold, leaf spots can appear on copper-sensitive crops. If concerned about tree sensitivity, test first on a small area.

¹ General re-entry. ² Hand thinning. ³ Harvest. ⁴ Maximum 6 applications per season with no more than 2 dormant applications. ⁵ No more than 2 applications in the 3 weeks prior to harvest.

⁶ Maximum 10 applications per season with no more than 2 dormant applications. — = Information is not specified on the product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Shuck split to Shuck fall						
Oriental fruit moth	General Comments: - Where mating disruption products have been placed in the orchard, a pesticide application is generally not required at this time. - Apply insecticides within the specified degree-days (DDC, base 7.2°C) after sustained first-generation moth catch. For information on calculating degree days, see Appendix B: <i>Degree-Day Modeling</i>, page 428. - Some of these products are toxic to bees. Do not apply when bees are active or hives are in the orchard or when cover crops are in bloom. Refer to label for specific bee toxicity statements.					
	4A	Assail 70 WP	120–240 g/ha	12 hours ¹ /6 days ²	7 days	Apply at 111–139 DDC. For optimum activity, use high rate in a minimum spray volume of 1,000 L/ha. Do not apply more than once every 12 days.
	5	Delegate	420 g/ha	12 hours	3 days	Apply at 194–208 DDC. Reapply 10–14 days later if trap catch is extended.
	15	Rimon 10 EC	1.35–3.35 L/ha	12 hours	14 days	Apply at 111–139 DDC.
	18	Intrepid	1.5 L/ha	12 hours	14 days	Apply at 111–139 DDC. Use for first generation only.
	28	Altacor	285 g/ha	12 hours	1 day	Apply at 194–208 DDC. Reapply 10–14 days later if trap catch is extended. Do not tank-mix or make sequential applications of Exirel with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions
		Exirel	500–750 mL/ha	12 hours	3 days	
Plum curculio	General Comments: - Apricots are very susceptible to plum curculio injury. - Scout edges of orchards near woodlots and wild hosts in spring. Damage often occurs only on the border of the orchard. Check small fruit for crescent-shaped egg-laying scars and reassess developing fruit for new damage 7–10 days after insecticide is applied. - Some of these products are toxic to bees. Do not apply when bees are active or hives are in the orchard or cover crops are in bloom. Refer to label for specific bee toxicity statements.					
	4A	Assail 70 WP	240 g/ha	12 hours ¹ /6 days ²	7 days	Under high pressure, may provide suppression only.
		Clutch 50 WDG	210 g/ha	12 hours	7 days	May provide suppression of oriental fruit moth if applied at the appropriate timing and at 420 g/ha.
	28	Exirel	1.0–1.5 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
	First cover (10–12 days after Shuck fall)					
Brown rot	Use one of the fungicides listed for Brown rot at Bloom . Rotate among fungicide groups for resistance management. Apricots are extremely susceptible to brown rot from bloom through pit-hardening. Quash rate is 175–280 g/ha for fruit rot. Do not use Sercadis after Petal fall .					
Bacterial spot	M	Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	Do not mix with lime. Reapply at 7–14-day intervals if weather is wet and warm. May cause some defoliation. During excessive moisture and cold, leaf spots can appear on copper-sensitive crops. If concerned about tree sensitivity, test first on a small area.

¹ General re-entry. ² Hand thinning. ³ Harvest. ⁴ Maximum 6 applications per season with no more than 2 dormant applications. ⁵ No more than 2 applications in the 3 weeks prior to harvest.

⁶ Maximum 10 applications per season with no more than 2 dormant applications. — = Information is not specified on the product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
First cover (10–12 days after Shuck fall)						
Scab	General Comments: - Fungicides applied for brown rot may have activity against scab. See Table 5–7. <i>Activity of Fungicides on Tender Fruit Diseases and Impact on Honeybees</i>, page 340. - Repeat applications at 7–14-day intervals.					
	3	Quash	175–245 g/ha	12 hours ¹ /9 days ²	14 days	Suppression only.
	7	Fontelis	1.0–1.5 L/ha	12 hours	0 days	Contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions. In orchards with a history of scab or under high disease pressure, use high rate and shorten intervals between applications.
Plum curculio	Use one of the insecticides listed for Plum curculio at Shuck split to Shuck fall .					
Special sprays (when monitoring indicates the need)						
Aphids	4C	Closer	100–200 mL/ha	12 hours	7 days	Use the higher rate for longer residual activity. Where possible, rotate with products outside of Group 4.
	4C+5	TwinGuard	250 g/ha	12 hours	7 days	Green peach aphid only. Where possible, rotate with products outside of Group 4.
	28	Exirel	0.75–1.5 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
	29	Beleaf 50 SG	120–160 g/ha	12 hours ¹ /48 hours ²	14 days	No product specific comments.
	NC	Vegol Crop Oil *	2% v/v	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage at a rate of 2% v/v (20 L/1,000 L water). Tolerance has not been determined for all varieties. Test a small area of each variety prior to spraying the whole block. Do not use within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use with 14 days of Supra Captan, Maestro or copper product and 30 days of sulphur product. Do not apply to wet foliage.
European red mite	General Comments: - European red mite is a sporadic pest in apricot orchards. - Apply when there are 10 active mites per leaf in the absence of beneficial predatory mites.					
	23	Envidor 240 SC	750 mL/ha	12 hours	7 days	Control may not be apparent for 2–3 weeks. Apply before mite populations build up.
	NC	Vegol Crop Oil *	2% v/v	12 hours	0 days	See comments on this product for European red mite at Dormant .

¹ General re-entry. ² Hand thinning. ³ Harvest. ⁴ Maximum 6 applications per season with no more than 2 dormant applications. ⁵ No more than 2 applications in the 3 weeks prior to harvest.

⁶ Maximum 10 applications per season with no more than 2 dormant applications. — = Information is not specified on the product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Special sprays (when monitoring indicates the need)						
Oriental fruit moth	General Comments: - Check harvest dates of early varieties and do not spray within the preharvest interval. - Apply insecticide within the specified degree-days (DDC, base 7.2°C) after sustained first-generation moth catch. If flight is extended beyond 10–14 days, reapply the same product used for this generation. For information on calculating degree days, see Appendix B: <i>Degree-Day Modeling</i>, page 428. - Spotted wing drosophila (SWD) are attracted to fruit as soon as they turn from green to yellow. Use a product for oriental fruit moth that is also active against SWD if present in the area. See Table 5–8. <i>Activity of Insecticides and Miticides on Tender Fruit Pests and Impact on Honeybees</i>, page 343.					
	4A	Assail 70 WP	120–240 g/ha	12 hours ¹ /6 days ²	7 days	Apply at 555–583 DDC and again at 722–750 DDC. For optimum activity, use high rate in a minimum spray volume of 1,000 L/ha. Do not apply more than once every 12 days.
	4C+5	TwinGuard	500 g/ha	12 hours	7 days	Apply at 639–667 DDC and again at 805–833 DDC. Where possible, rotate with products outside of Group 4.
	5	Delegate	420 g/ha	12 hours	3 days	Apply at 639–667 DDC and again at 805–833 DDC.
	15	Rimon 10 EC	1.35–3.35 L/ha	12 hours	14 days	Apply at 555–583 DDC and again at 722–750 DDC.
	28	Altacor	285 g/ha	12 hours	1 day	Apply at 639–667 DDC and again at 805–833 DDC. Do not tank-mix or make sequential applications of Exirel with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
	Exirel	500–750 mL/ha	12 hours	3 days		
Obliquebanded leafroller, Leafrollers	General Comments: - Insecticides for summer-generation larvae should be applied at 240–280 DDC (base 6.1°C) after first sustained moth catch. For information on calculating degree days, see Appendix B: <i>Degree-Day Modeling</i>, page 428. - Reapply if larval activity is extended.					
	4C+5	TwinGuard	250–500 g/ha	12 hours	7 days	No product specific comments.
	5	Delegate	420 g/ha	12 hours	3 days	No product specific comments.
		Entrust * or Success	364 mL/ha 182 mL/ha	when dry	3 days	No product specific comments.
	11	Bioprotec CAF * or Dipel 2X DF *	4 L/ha 1.125 kg/ha	12 hours	0 days	Product must be consumed to be effective. Spray when and where pests are actively feeding. Apply in a high-volume spray to ensure thorough coverage on both sides of the leaf. Apply to young larvae, early in infestation. Death of insect may take several days. Reapply at 5–7-day intervals if larvae activity is extended. Acidify spray mix to below pH 7.0 and apply on cloudy days or in the evening.
	15	Rimon 10 EC	1.35–3.35 L/ha	12 hours	14 days	No product specific comments.
	28	Altacor	285 g/ha	12 hours	1 day	No product specific comments.
		Exirel	0.5–1.0 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.

¹ General re-entry. ² Hand thinning. ³ Harvest. ⁴ Maximum 6 applications per season with no more than 2 dormant applications. ⁵ No more than 2 applications in the 3 weeks prior to harvest.

⁶ Maximum 10 applications per season with no more than 2 dormant applications. — = Information is not specified on the product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Special sprays (when monitoring indicates the need)						
Lesser peachtree borer, Peachtree borer	General Comments: Peachtree borers are sporadic pests of apricots.					
	NC	Isomate-PTB Dual *	375 dispensers/ha	—	—	Reduces mating of peachtree and lesser peachtree borer. Apply before moth emergence begins, (i.e., typically at or before shuck split). Dispensers are designed to last the entire season. At high-pressure sites, insecticides may be needed as long as the maximum labelled rate is not exceeded. For information on mating disruption, see OMAFRA Factsheet 03–079, <i>Mating Disruption for Management of Insect Pests</i> .
	15	Rimon 10 EC	1.4 L/1,000 L water	12 hours	14 days	Use pheromone traps to monitor adult activity and begin sprays 1 week after first flight. Reapply at 3-week intervals. Direct sprays with a handgun to cover trunk and scaffold limbs thoroughly. Do not spray fruit.
Brown marmorated stink bug	General Comments: - Breeding populations of this pest are present in Ontario. Check ontario.ca/stinkbug for updates on pest development, registered products and management strategies. - There are currently no thresholds established. Apply when insects are first detected or early damage found.					
	4A	Clutch 50 WDG	210–420 g/ha	12 hours	7 days	Suppression only. This product is toxic to beneficial insects and should be used only when necessary.
Spotted wing drosophila	General Comments: - Spotted wing drosophila insert eggs into ripening fruit. Larvae develop in the fruit and may be present at harvest, contributing to premature breakdown. - Weekly insecticides are recommended when fruit is ripening or ripe, and flies are present. - Frequent picking, burial of grade-out fruit, and general sanitation are very important to prevent problems. - These products rely on contact in order to control spotted wing drosophila adults. Apply in a high-volume spray to ensure thorough coverage of fruit.					
	5	Delegate	420 g/ha	12 hours	3 days	No product specific comments.
	28	Exirel	1.0–1.5 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
San Jose scale	4C+5	TwinGuard	500 g/ha	12 hours	7 days	Apply when crawlers are active in orchards with a history of scale.
Prepick to harvest						
Check preharvest interval before spraying early maturing varieties. See Table 5–1. <i>Products Used on Apricots</i> , page 255.						
Brown rot	General Comments: Apricots are extremely susceptible to brown rot just before picking.					
	M	Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	Do not mix with lime. May cause some defoliation. During excessive moisture and cold, leaf spots can appear on copper-sensitive crops. If concerned about tree sensitivity, test first on a small area.
		Fracture	1.5–3.3 L/ha	12 hours	0 days	Under high disease pressure, use high rate. Do not mix with foliar fertilizers.

¹ General re-entry. ² Hand thinning. ³ Harvest. ⁴ Maximum 6 applications per season with no more than 2 dormant applications. ⁵ No more than 2 applications in the 3 weeks prior to harvest.

⁶ Maximum 10 applications per season with no more than 2 dormant applications. — = Information is not specified on the product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Prepick to harvest						
Check preharvest interval before spraying early maturing varieties. See Table 5–1. <i>Products Used on Apricots</i> , page 255.						
Brown rot (cont'd)	M	Maestro 80 DF or Supra Captan 80 WDG	4.5 kg/ha	48 hours	2 days	Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Fontelis or Exirel.
	3	Bumper 432 EC or Fitness or Jade or Tilt 250 E	300 mL/ha 300 mL/ha 500 mL/ha 500 mL/ha	12 hours 72 hours 72 hours 72 hours	3 days	Maximum of 2 applications of any of these fungicides in the 3 weeks prior to harvest.
		Indar	140 g/ha	12 hours	1 day	No product specific comments.
		Quash	175–280 g/ha	12 hours ¹ /9 days ²	14 days	Under high disease pressure, use high rate.
	7	Cantus WDG	370 g/ha	12 hours	0 days	No product specific comments.
		Fontelis	1.0–1.75 L/ha	12 hours	0 days	Contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
	7+11	Pristine WG	750 g/ha	when dry ¹ / 24 hours ³ /10 days ²	1 day	No product specific comments.
	44	Serenade OPTI *	1.1–1.7 kg/ha	when dry	0 days	Suppression only.
	P5	Regalia Maxx *	0.125–0.25% v/v in 500–1,000 L water/ha	when dry	0 days	Suppression only. Apply before symptoms develop. Use 0.125% (1.25 L in 1,000 L water) in a tank-mix with other brown rot fungicides or 0.25% (2.5 L in 1,000 L water) in rotation with other brown rot fungicides.
Postharvest fruit treatment						
Blue mould, Grey mould, Brown rot, Rhizopus rot	12	Scholar 230 SC	496 mL/378 L water	—	postharvest	Postharvest treatment may be necessary during wet harvest seasons. These treatments will prolong storage time while providing control of postharvest diseases. See label for dip and drench instructions.

¹ General re-entry. ² Hand thinning. ³ Harvest. ⁴ Maximum 6 applications per season with no more than 2 dormant applications. ⁵ No more than 2 applications in the 3 weeks prior to harvest.

⁶ Maximum 10 applications per season with no more than 2 dormant applications. — = Information is not specified on the product label. * = Potentially organic. Check with certifying body.

Table 5–1. Products Used on Apricots

Use this table as a guide but refer to product label for specific information.

The **preharvest interval** is the number of days between the last spray and first harvest.

The **restricted entry interval** is the minimum interval that must be observed between application of the pesticide and work in the treated crop without protective equipment. If no re-entry period is stated on the label, assume it is 12 hours.

The **maximum applications** is the labelled maximum number or product amount applied for the growing season and may be higher than what is recommended for resistance management or for the preservation of beneficial insects.

Products listed as **potentially organic** may be acceptable for organic use based on *Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec publication Bulletin D'Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with certifying body to verify the acceptability of any product prior to using it.

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
Products used for insect and mite control or suppression							
Altacor	28981	chlorantraniliprole	28	1 day	12 hours	3 (max. 645 g/ha)	—
Assail 70 WP	27128	acetamiprid	4A	7 days	12 hours ¹ /6 days ²	4	—
Beleaf 50 SG	29796	flonicamid	29	14 days	12 hours ¹ /48 hours ²	3	—
Bioprotec CAF	26854	<i>Bacillus thuringiensis</i>	11	0 days	12 hours	—	✓
Closer	30826	sulfoxaflor	4C	7 days	12 hours	2	—
Clutch 50 WDG	29382	clothianidin	4A	7 days	12 hours	2 (max. 420 g/ha)	—
Delegate	28778	spinetoram	5	3 days	12 hours	3	—
Dipel 2X DF	26508	<i>Bacillus thuringiensis</i>	11	0 days	12 hours	—	✓
Entrust	30382	spinosad	5	3 days	when dry	3	✓
Envior 240 SC	28051	spirodiclofen	23	7 days	12 hours	1	—
Exirel	30895	cyantraniliprole	28	3 days	12 hours	4	—
Intrepid	27786	methoxyfenozide	18	14 days	12 hours	1	—
Isomate OFM TT	31419	pheromone, oriental fruit moth	NC	—	—	—	✓
Isomate-PTB Dual	30042	pheromone, peachtree borer, lesser peachtree borer	NC	—	—	—	✓
Malathion 85 E	8372	malathion	1B	7 days	12 hours ¹ /48 hours ³ /72 hours ²	2	—
Purespray Green Spray Oil 13 E	27666	mineral oil	NC	—	12 hours	2 (dormant)	✓
Rimon 10 EC	28881 28515	novaluron	15	14 days	12 hours	3	—

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Plant Extract.

— = Information is not specified on the product label. ✓ = Potentially organic. Check with certifying body.

¹ General re-entry. ² Hand thinning. ³ Harvest. ⁴ Maximum 6 applications per season with no more than 2 dormant applications. ⁵ No more than 2 applications in the 3 weeks prior to harvest.

⁶ Maximum 10 applications per season with no more than 2 dormant applications.

Table 5–1. Products Used on Apricots (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
Products used for insect and mite control or suppression							
Success	26835	spinosad	5	3 days	when dry	3	—
Superior 70 Oil	9542 14981	mineral oil	NC	prebloom only	12 hours	—	✓
TwinGuard	31442	sulfoxaflor + spinetoram	4C+5	7 days	12 hours	2	—
Vegol Crop Oil	32408	canola oil	NC	0 days	12 hours	2/4 ⁴	✓
Products used for disease control or suppression							
Bumper 432 EC	28017	propiconazole	3	3 days	12 hours	5 ⁵	—
Cantus WDG	30141	boscalid	7	0 days	12 hours	5	—
Cueva	31825	copper octanoate	M	1 day	4 hours	15	—
Fracture	32139	BLAD polypeptide	M	0 days	12 hours	3	—
Fitness	32639	propiconazole	3	3 days	72 hours	5 ⁵	—
Fontelis	30331	penthiopyrad	7	0 days	12 hours	max. 4.5 L/ha	—
Indar	27294	fenbuconazole	3	1 day	12 hours	7	—
Jade	24030	propiconazole	3	3 days	72 hours	5 ⁵	—
Kenja 400 SC	31758	isofetamid	7	1 day	12 hours	3	—
Maestro 80 DF	26408	captan	M	2 days	48 hours	—	—
Pristine WG	27985	boscalid + pyraclostrobin	7+11	1 day	when dry ¹ / 24 hours ³ / 10 days ²	5	—
Purespray Green Spray Oil 13 E	27666	mineral oil	NC	—	12 hours	2/8 ⁶	✓
Quash	30402	metconazole	3	14 days	12 hours ¹ /9 days ²	1	—
Regalia Maxx	30199	extract of <i>Reynoutria sachalinensis</i>	P5	0 days	when dry	—	✓
Rovral WP	15213	iprodione	2	1 day	12 hours	—	—
Scholar 230 SC	29528	fludioxonil	12	postharvest	—	1	—
Sercadis	31697	fluxapyroxad	7	0 days	12 hours	3	—
Serenade OPTI	31666	<i>Bacillus subtilis</i>	44	0 days	when dry	—	✓
Supra Captan 80 WDG	24613	captan	M	2 days	48 hours	—	—
Tilt 250 E	19346	propiconazole	3	3 days	72 hours	5 ⁵	—

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Plant Extract.

— = Information is not specified on the product label. ✓ = Potentially organic. Check with certifying body.

¹ General re-entry. ² Hand thinning. ³ Harvest. ⁴ Maximum 6 applications per season with no more than 2 dormant applications. ⁵ No more than 2 applications in the 3 weeks prior to harvest.

⁶ Maximum 10 applications per season with no more than 2 dormant applications.

SWEET CHERRY CALENDAR

In this section:

- Read the product label and follow all safety precautions. 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>.
- Consult the product label for suggested water volumes. Otherwise, use enough water to ensure thorough spray coverage. Where the product rate is listed in amount per 1,000 L and if a water volume is not provided on the label, use enough water to wet the foliage to the near drip point.
- For preharvest interval, restricted entry interval and maximum number of applications, see Table 5–2. *Products Used on Sweet Cherries*, page 268.
- **Products are listed by chemical group and in alphabetical order within each group. The order does not reflect efficacy.** See Table 5–7. *Activity of Fungicides on Tender Fruit Diseases and Impact on Honeybees*, page 340 and Table 5–8. *Activity of Insecticides and Miticides on Tender Fruit Pests and Impact on Honeybees*, page 343, for efficacy ratings.
- Where a product in the calendar is followed by a “*”, it is potentially acceptable for organic use based on *Ministère de l’Agriculture, des Pêcheries et de l’Alimentation du Québec publication Bulletin D’Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with your certifying body to verify the acceptability of any product prior to using it.
- Information on the timing and rates of application for plant growth regulators and chemical thinners can be found in the crop calendars. For additional information on plant growth regulators and thinning, visit http://www.omafra.gov.on.ca/english/crops/hort/tender_fruit.html and click on *Plant Growth Regulators for Fruit Crops* and *Thinning of Tree Fruit*.

Resistance Management

To delay development of resistance to insecticides, miticides and fungicides, follow resistance management guidelines outlined in *Resistance Management Strategies*, page 393. The chemical group is indicated in the column labelled “Group” before the “Product” column. Products belonging to the same chemical group are grouped together in the calendar. Multi-site (M) fungicides are not prone to resistance and do not have to be rotated. Some products are not classified to mode of action (NC) and the mode of action has not been determined for others (U or UN). Group 44 and 46 fungicides are not known to be prone to resistance.

Fungicide resistance management

Take the following steps to avoid rapid development of fungicide resistance:

- Do not reduce rates below those specified on the label.
- Do not use products containing the same chemical group in consecutive applications.
- Do not use Rovral, Bumper, Fitness, Indar, Jade, Tilt, Quash, Cantus, Fontelis, Kenja, Sercadis or Pristine when sporulating lesions of brown rot are present.
- Do not exceed maximum number of applications on the label.

Insecticide resistance management

Take the following steps to avoid rapid development of insecticide resistance:

- For pests with discrete generations (oriental fruit moth, plum curculio and obliquebanded leafroller), do not use insecticides from the same group for more than one generation. Within a generation, if more than one spray is required, use a product from the same chemical group.
- For pests with overlapping generations (aphids, mites), do not use products containing the same chemical group in consecutive applications.
- Do not exceed maximum number of applications on the label.

Bee Toxicity

Some insecticides are toxic to bees and other pollinating insects. Use of insecticides on flowering crops requires careful management to avoid negative effects on pollinators. Some insecticides cannot be applied prior to or during bloom. Insecticides should not be applied when tree fruit are in bloom. Do not apply insecticides when bees are active. Before and after bloom, bees may be present on flowering cover crops and weeds—do not allow drift of insecticides onto these or other flowering crops. Always follow label precautions to avoid impacts on bees. For more information, see *Bee Poisoning*, page 5, and honeybee toxicity ratings in Table 5–7. *Activity of Fungicides on Tender Fruit Diseases and Impact on Honeybees*, page 340, and Table 5–8. *Activity of Insecticides and Miticides on Tender Fruit Pests and Impact on Honeybees*, page 343.

Buffer Zones

Leave a suitable buffer zone between treatment area and adjacent sensitive areas, such as hedgerows, woodlots and freshwater habitats. Zones may vary depending on the product used, growth stage of the crop and method of application including the use of drift-reducing technology. Check the pesticide label for requirements.

Use Health Canada’s online spray drift calculator to modify the buffer zone specified on the label based on weather conditions, category of spray equipment and 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. Unfortunately, this model does not account for carrier volume, travel speed or crop stage.

Observing buffer zones is a legal requirement. A record of the buffer zone modification, if any, must be retained for at least one year from the time of application.

Crop Nutrition

Crop nutrition is important for plant growth, fruit quality development and the acquisition of adequate cold hardiness by tree fruit. For fruit crops, soil testing, plant tissue analysis and visual deficiency symptoms all play an important role in assessing and monitoring the crop's nutritional status. For more information, visit http://www.omafra.gov.on.ca/english/crops/hort/tender_fruit.html (click on *Soil Management, Fertilizer Use, Crop Nutrition and Cover Crops for Fruit Production*) and see OMAFRA Publication 611, *Soil Fertility Handbook*. For soil testing and plant tissue analysis services, see Appendix E: *Accredited Soil-Testing Laboratories in Ontario*, page 435.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Dormant (before bud break)						
Bacterial canker	General Comments: • Apply in early spring before bud break. Later applications in the spring may cause injury. • Use low rate on small trees and high rate on large trees.					
	M	Copper Spray * or Guardsman Copper Oxychloride 50 *	6–9 kg/1,000 L water	48 hours	2 days	No product specific comments.
		Cueva	1% v/v in 470– 940 L water/ha	4 hours	1 day	No product specific comments.
White bud						
Brown rot (blossom blight stage)	General Comments: • Spray when first blossoms open. If wet weather occurs, reapply at 50% bloom and at full bloom. • Group 2, 3, 7, 11 and 17 fungicides are locally systemic and will penetrate petals to protect fruit from infection as bloom starts to occur. Consult labels for information on drying time required before rain.					
	M	Cueva	1% v/v in 470– 940 L water/ha	4 hours	1 day	Do not mix with lime. May cause some defoliation. During excessive moisture and cold, leaf spots can appear on copper-sensitive crops. If concerned about tree sensitivity, test first on a small area.
		Fracture	1.5–3.3 L/ha	12 hours	0 days	Under high disease pressure, use high rate. Do not mix with foliar fertilizers.
	2	Rovral WP	1.75 kg/ha	12 hours	1 day	No product specific comments.
	3	Bumper 432 EC or Fitness or Jade or Tilt 250 E	300 mL/ha 300 mL/ha 500 mL/ha 500 mL/ha	12 hours 72 hours 72 hours 72 hours	3 days	No product specific comments.
		Funginex DC	2.5 L/ha	48 hours	prebloom	No product specific comments.
		Indar	140 g/ha	12 hours	1 day	No product specific comments.

¹ General re-entry. ² Harvest. ³ Hand thinning. — = Information not applicable or not indicated on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
White bud						
Brown rot (blossom blight stage) (cont'd)	3	Nova	340 g/ha	12 hours ¹ /5 days ² /12 days ³	1 day	No product specific comments.
		Quash	175–245 g/ha	12 hours ¹ /9 days ³	14 days	Under high disease pressure, use high rate. Maximum of 1 application per season.
	7	Cantus WDG	370 g/ha	12 hours	0 days	No product specific comments.
		Fontelis	1.0–1.75 L/ha	12 hours	0 days	Contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
		Kenja 400 SC	913 mL/ha	12 hours	1 day	Suppression only. Use with a silicone surfactant. See Table 5–9. <i>Adjuvants Used in Ontario</i> , page 346.
		Sercadis	333 mL/ha	12 hours	0 days	Use a non-ionic surfactant at a rate of 0.125% v/v (1.25 L in 1,000 L water). See Table 5–9. <i>Adjuvants Used in Ontario</i> , page 346.
	7+11	Pristine WG	750 g/ha	when dry ¹ /24 hours ² /10 days ³	1 day	No product specific comments.
	17	Elevate 50 WDG	1.7 kg/ha	4 hours	1 day	No product specific comments.
	44	Serenade OPTI *	1.1–1.7 kg/ha	when dry	0 days	Suppression only.
	P5	Regalia Maxx *	0.125–0.25% v/v in 500–1,000 L water/ha	when dry	0 days	Suppression only. Apply before symptoms develop. Use 0.125% (1.25 L in 1,000 L water) in a tank-mix with other brown rot fungicides or 0.25% (2.5 L in 1,000 L water) in rotation with other brown rot fungicides.
Bloom						
DO NOT APPLY INSECTICIDES WHILE CHERRY TREES ARE IN BLOOM. SEE BEE POISONING, PAGE 5.						
Brown rot (blossom blight stage)	General Comments: - Blossom blight is favoured by wet, warm (above 16°C) weather, especially when large numbers of mummies are present in the trees. - Apply sprays during the bloom period if weather remains favourable for an extended blight or bloom period. - Group 2, 3, 7, 11 and 17 fungicides are locally systemic and will penetrate petals to protect fruit from infection as bloom starts to occur. Consult labels for information on drying time required before rain.					
	M	Bravo ZN	7 L/ha	48 hours	40 days/shuck split	Do not apply after Shuck fall to avoid fruit injury. Do not use within 14 days of Purespray Green Spray Oil. Do not tank-mix or make sequential applications with Exirel.
		Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	Do not mix with lime. May cause some defoliation. During excessive moisture and cold, leaf spots can appear on copper-sensitive crops. If concerned about tree sensitivity, test first on a small area.

¹ General re-entry. ² Harvest. ³ Hand thinning. — = Information not applicable or not indicated on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Bloom						
DO NOT APPLY INSECTICIDES WHILE CHERRY TREES ARE IN BLOOM. SEE BEE POISONING, PAGE 5.						
Brown rot (blossom blight stage) (cont'd)	M	Fracture	1.5–3.3 L/ha	12 hours	0 days	Under high disease pressure, use high rate. Do not mix with foliar fertilizers.
		Maestro 80 DF or Supra Captan 80 WDG	4.5 kg/ha	48 hours	2 days	Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Fontelis or Exirel.
	1	Senator 50 SC	2.45 L/ha	12 hours	1 day	No product specific comments.
	2	Rovral WP	1.75 kg/ha	12 hours	1 day	No product specific comments.
	3	Bumper 432 EC or Fitness or Jade or Tilt 250 E	300 mL/ha 300 mL/ha 500 mL/ha 500 mL/ha	12 hours 72 hours 72 hours 72 hours	3 days	No product specific comments.
		Funginex DC	2.5 L/ha	48 hours	prebloom	No product specific comments.
		Indar	140 g/ha	12 hours	1 day	No product specific comments.
		Nova	340 g/ha	12 hours ¹ / 5 days ² /12 days ³	1 day	No product specific comments.
		Quash	175–245 g/ha	12 hours ¹ /9 days ³	14 days	Under high disease pressure, use high rate.
	7	Cantus WDG	370 g/ha	12 hours	0 days	No product specific comments.
		Fontelis	1.0–1.75 L/ha	12 hours	0 days	Contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
		Kenja 400 SC	913 mL/ha	12 hours	1 day	Suppression only. Use with a silicone surfactant. See Table 5–9. <i>Adjuvants Used in Ontario</i> , page 346.
		Sercadis	333 mL/ha	12 hours	0 days	Use a non-ionic surfactant at a rate of 0.125% v/v (1.25 L in 1,000 L water). See Table 5–9. <i>Adjuvants Used in Ontario</i> , page 346.
	7+11	Pristine WG	750 g/ha	when dry ¹ / 24 hours ² /10 days ³	1 day	No product specific comments.
	17	Elevate 50 WDG	1.7 kg/ha	4 hours	1 day	No product specific comments.
	44	Serenade OPTI *	1.1–1.7 kg/ha	when dry	0 days	Suppression only.
	P5	Regalia Maxx *	0.125–0.25% v/v in 500–1,000 L water/ha	when dry	0 days	Suppression only. Apply before symptoms develop. Use 0.125% (1.25 L in 1,000 L water) in a tank-mix with other brown rot fungicides or 0.25% (2.5 L in 1,000 L water) in rotation with other brown rot fungicides.
Bacterial canker	24	Kasumin 2L	5 L/ha in 1,000 L water	12 hours	30 days	For suppression of bacterial canker and control of blossom blast. Begin applications at early bloom. Repeat at 7-day intervals.

¹ General re-entry. ² Harvest. ³ Hand thinning. — = Information not applicable or not indicated on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Bloom						
DO NOT APPLY INSECTICIDES WHILE CHERRY TREES ARE IN BLOOM. SEE BEE POISONING, PAGE 5.						
Terminal growth management	NC	Apogee	450 g/1,000 L water	12 hours	20 days	Can be used to reduce terminal growth. Two weeks are required to slow growth effectively. Make the first application when terminal shoots are no longer than 2.5–5 cm (approximately late bloom). If required, make a second application 14–21 days later. Do not tank-mix with calcium products. The use of a non-ionic surfactant and ammonium sulphate conditioner is recommended. See label and Table 5–9. <i>Adjuvants Used in Ontario</i> , page 346, for more details. Effects on fruit set, size and yield vary among cultivars. Resurgence in late-season growth may occur in some situations. For more information, visit http://www.omafra.gov.on.ca/english/crops/hort/tender_fruit.html and click on <i>Plant Growth Regulators for Fruit Crops</i> .
Petal fall						
Black cherry aphid	General Comments: Some of these products are toxic to bees. Do not apply when bees are active or hives are in the orchard. Refer to label for specific bee toxicity statements					
	4A	Actara 25 WG	160 g/ha	12 hours	14 days	No product specific comments.
		Clutch 50 WDG	210 g/ha	12 hours	7 days	No product specific comments.
	4C	Closer	100–200 mL/ha	12 hours	7 days	Apply before populations reach threshold. Where possible, rotate with products outside of Group 4.
	23	Movento 240 SC	365 mL/ha	12 hours	7 days	Most effective on young stages of aphids. Control may not be apparent for 2–3 weeks. Under high pressure, a second application may be necessary 2 weeks later. Tank-mix with an adjuvant/additive that has spreading and penetrating properties at a suggested rate of 0.2% v/v (2 L/1,000 L water). See label and Table 5–9. <i>Adjuvants Used in Ontario</i> , page 346, for further details. Do not tank-mix with sulphur.
	NC	Vegol Crop Oil *	2% v/v	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage at a rate of 2% v/v (20 L/1,000 L water). Tolerance has not been determined for all varieties. Test a small area of each variety prior to spraying the whole block. Do not use within 14 days of Supra Captan, Maestro or copper product and 30 days of sulphur product. Do not use within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed trees. Do not apply to wet foliage.
Terminal growth management	Use one of the products listed for Terminal growth management at Bloom .					

¹ General re-entry. ² Harvest. ³ Hand thinning. — = Information not applicable or not indicated on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Shuck fall						
Plum curculio	General Comments: - Spray when most of the shucks are off and plum curculio activity is observed, usually when temperatures are above 16°C. - These products are toxic to bees. Do not apply when bees are active or hives are in the orchard. Refer to label for specific bee toxicity statements.					
	3	Silencer 120 EC	104 mL/ha	24 hours	7 days	Apply when fruit is the size of a pea, and 10–12 days later if oviposition scars are detected. Efficacious under low pressure only.
	4A	Assail 70 WP	240 g/ha	12 hours ¹ /6 days ³	7 days	No product specific comments.
		Clutch 50 WDG	210 g/ha	12 hours	7 days	No product specific comments.
	28	Exirel	1.0–1.5 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
Brown rot	General Comments: Group 2, 3, 7, 11 and 17 fungicides are locally systemic. Consult labels for information on drying time required before rain.					
	M	Fracture	1.5–3.3 L/ha	12 hours	0 days	Under high disease pressure, use high rate. Do not mix with foliar fertilizers.
		Maestro 80 DF or Supra Captan 80 WDG	4.5 kg/ha	48 hours	2 days	May cause leaf injury to Schmidt and Emperor Francis varieties in postbloom sprays. Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Fontelis or Exirel.
	2	Rovral WP	1.75 kg/ha	12 hours	1 day	No product specific comments.
	3	Bumper 432 EC	300 mL/ha	12 hours	3 days	No product specific comments.
		or Fitness	300 mL/ha	72 hours		
		or Jade	500 mL/ha	72 hours		
		or Tilt 250 E	500 mL/ha	72 hours		
		Indar	140 g/ha	12 hours	1 day	No product specific comments.
		Quash	175–280 g/ha	12 hours ¹ /9 days ³	14 days	Under high disease pressure, use high rate.
	7	Cantus WDG	370 g/ha	12 hours	0 days	No product specific comments.
		Fontelis	1.0–1.75 L/ha	12 hours	0 days	Contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
		Kenja 400 SC	913 mL/ha	12 hours	1 day	Suppression only. Use with a silicone surfactant. See Table 5–9. <i>Adjuvants Used in Ontario</i> , page 346.
	7+11	Pristine WG	750 g/ha	when dry ¹ / 24 hours ² /10 days ³³	1 day	No product specific comments.
	17	Elevate 50 WDG	1.7 kg/ha	4 hours	1 day	No product specific comments.
	P5	Regalia Maxx *	0.125–0.25% v/v in 500–1,000 L water/ha	when dry	0 days	Suppression only. Apply before symptoms develop. Use 0.125% (1.25 L in 1,000 L water) in a tank-mix with other brown rot fungicides or 0.25% (2.5 L in 1,000 L water) in rotation with other brown rot fungicides.

¹ General re-entry. ² Harvest. ³ Hand thinning. — = Information not applicable or not indicated on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
First cover (12 days after Shuck fall)						
Plum curculio	Use one of the insecticides listed for Plum curculio at Shuck fall . Monitor 7 days after the insecticide at shuck split for new plum curculio damage. Apply insecticide if new crescent-shaped cuts are found.					
Brown rot	Use one of the fungicides listed for Brown rot at Shuck fall . Rotate among fungicide groups for resistance management.					
Second cover (12 days after First cover)						
Cherry fruit fly	General Comments: - Cherry fruit fly and spotted wing drosophila (SWD) are attracted to fruit as soon as they turn from green to yellow. Start sprays at that point. - Use a product for cherry fruit fly that is also active against SWD if present in the area. See Table 5–8. <i>Activity of Insecticides and Miticides on Tender Fruit Pests and Impact on Honeybees</i>, page 343.					
	3	Silencer 120 EC	104 mL/ha	24 hours	7 days	No product specific comments.
	4A	Admire 240 Flowable or Alias 240 SC	230 mL/ha 233 mL/ha	24 hours	7 days	Apply as a foliar spray within 6 days of first fly emergence. Allow at least 10 days between applications.
	5	Delegate	420 g/ha	12 hours	5 days	Suppression only.
		Entrust *	364 mL/ha	when dry	3 days	No product specific comments.
		GF-120 Fruit Fly Bait *	1.5 L/ha	when dry	0 days	Spray as soon as monitoring traps indicate flies are present or 2–3 weeks before ripening. Reapply every 7 days or sooner if rain or overhead irrigation washes off residue. Large droplet sizes optimize the attractiveness of the bait. Proper application techniques help ensure adequate coverage. Apply using an all-terrain vehicle fitted with an appropriate sprayer and nozzle for a large spray droplet size of 4–6 mm directed to underside of leaves and inside the canopy.
	28	Altacor	285 g/ha	12 hours	1 day	Suppression only.
		Exirel	0.75–1.5 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
Spotted wing drosophila	General Comments: - Spotted wing drosophila insert eggs into ripening fruit. Larvae develop in the fruit and may be present at harvest, contributing to premature breakdown. - Weekly insecticides are recommended when fruit is ripening or ripe, and flies are present. - Frequent picking, burial of grade-out fruit, and general sanitation are very important to prevent problems. - These products rely on contact in order to control spotted wing drosophila adults. Apply in a high-volume spray to ensure thorough coverage of fruit,					
	5	Delegate	420 g/ha	12 hours	5 days	No product specific comments.
	28	Exirel	1.0–1.5 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.

¹ General re-entry. ² Harvest. ³ Hand thinning. — = Information not applicable or not indicated on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Second cover (12 days after First cover)						
Plum curculio	General Comments: Monitor 7 days after previous insecticide for new plum curculio damage. Apply insecticide if new crescent-shaped cuts are found.					
	4A	Assail 70 WP	240 g/ha	12 hours ¹ /6 days ³	7 days	No product specific comments.
		Clutch 50 WDG	210 g/ha	12 hours	7 days	No product specific comments.
	28	Exirel	1.0–1.5 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions
Brown rot	Use one of the fungicides listed for Brown rot at Shuck fall . Rotate among fungicide groups for resistance management.					
Fruit quality	NC	Falgro Tablet	20 tablets/ 1,000 L water	12 hours	21 days	Delay fruit ripening 4–5 days, extending the picking period and delaying the susceptibility of fruit to rain cracks. Also increases fruit size, firmness and resistance to postharvest disorders. Apply 21 days before normal harvest when fruit is straw coloured. Harvest when fruit are red.
		ProGibb 40 SG	50 g/1,000 L water	12 hours	21 days	
Third cover						
Check preharvest interval before spraying early maturing cherries. See Table 5–2. <i>Products Used on Sweet Cherries</i> , page 268.						
Cherry fruit fly, Spotted wing drosophila	Use one of the insecticides listed for Cherry fruit fly at Second cover . In orchards where spotted wing drosophila has been trapped, use a product that has activity on both pests. Refer to Table 5–8. <i>Activity of Insecticides and Miticides on Tender Fruit Pests and Impact on Honeybees</i> , page 343.					
Brown rot	Use one of the fungicides listed for Brown rot at Shuck fall . Rotate among fungicide groups for resistance management.					
Prepick						
Check preharvest interval before spraying. See Table 5–2. <i>Products Used on Sweet Cherries</i> , page 268.						
Brown rot	Use one of the fungicides listed for Brown rot at Shuck fall . Rotate among fungicide groups for resistance management. Maximum of 2 applications of Bumper, Fitness, Jade or Tilt in the 3 weeks prior to harvest.					
Cherry fruit fly, Spotted wing drosophila	Use one of the insecticides listed for Cherry fruit fly at Second cover . In orchards where spotted wing drosophila has been trapped, use a product that has activity on both pests. Refer to Table 5–8. <i>Activity of Insecticides and Miticides on Tender Fruit Pests and Impact on Honeybees</i> , page 343.					
Postharvest orchard treatment						
Leaf spot	General Comments: Necessary only where leaf spot is a problem or where sweet cherries are beside tart cherries with leaf spot.					
	M	Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	May cause leaf injury to the Schmidt and Emperor Francis varieties in postbloom sprays.
		Maestro 80 DF or Supra Captan 80 WDG	4.5 kg/ha	48 hours	2 days	Apply as a dormant spray in late fall during period of dry weather.

¹ General re-entry. ² Harvest. ³ Hand thinning. — = Information not applicable or not indicated on product label. * = Potentially organic. Check with certifying body.

¹ General re-entry. ² Harvest. ³ Hand thinning. — = Information not applicable or not indicated on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Postharvest orchard treatment						
Leaf spot (cont'd)	3	Fitness	300 mL/ha	72 hours	3 days	Suppression only.
	7+11	Pristine WG	750 g/ha	when dry ¹ / 24 hours ² /10 days ³	1 day	No product specific comments.
	11	Flint	210 g/ha	12 hours ¹ /4 days ³	1 day	Do not apply where spray drift may reach Concord grapes.
	U12	Equal 65 WP or Syllit 400 FL	2.25 kg/ha 2 L/ha	48 hours	7 days	No product specific comments.
	P5	Regalia Maxx *	0.125–0.25% v/v in 500– 1,000 L water/ha	when dry	0 days	Suppression only. Apply before symptoms develop. Use 0.125% (1.25 L in 1,000 L water) in a tank-mix with other leaf spot fungicides or 0.25% (2.5 L in 1,000 L water) in rotation with other leaf spot fungicides.
Special sprays (when monitoring indicates the need)						
Japanese beetle	28	Altacor	285 g/ha	12 hours	1 day	Suppression only. Apply when feeding is first observed and repeat in 10–14 days if required.
		Exirel	1.0–1.5 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
Obliquebanded leafroller	General Comments: - Routine monitoring is necessary to determine if obliquebanded leafroller is causing damage in sweet cherries. - Apply at 240–280 DDC (base 6.1°C) after first sustained moth catch. For information on calculating degree days, see Appendix B: <i>Degree-Day Modeling</i>, page 428.					
	4C+5	TwinGuard	250–500 g/ha	12 hours	7 days	No product specific comments.
	5	Delegate	420 g/ha	12 hours	5 days	No product specific comments.
		Entrust * or Success	364 mL/ha 182 mL/ha	when dry	3 days	No product specific comments.
	11	Bioprotec CAF * or Dipel 2X DF *	4 L/ha 1.125 kg/ha	12 hours	0 days	Product must be consumed to be effective. Spray when and where pests are actively feeding. Apply in a high-volume spray to ensure thorough coverage on both sides of the leaf. Apply to young larvae, early in infestation. Death of insect may take several days. Reapply at 5–7-day intervals if larvae activity is extended. Acidify spray mix to below pH 7.0 and apply on cloudy days or in the evening.
	15	Rimon 10 EC	1.35–3.35 L/ha	12 hours	14 days	No product specific comments.
	28	Altacor	285 g/ha	12 hours	1 day	Will provide suppression of cherry fruit fly.

¹ General re-entry. ² Harvest. ³ Hand thinning. — = Information not applicable or not indicated on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Special sprays (when monitoring indicates the need)						
Peachtree borer, Lesser peachtree borer	NC	Isomate-PTB Dual *	375 dispensers/ha	—	—	Reduces mating of peachtree and lesser peachtree borer. Apply before moth emergence begins (i.e. typically at or before shuck split). Dispensers are designed to last the entire season. At high-pressure sites, insecticides may be needed as long as the maximum labelled rate is not exceeded. For more information on mating disruption, see OMAFRA Factsheet 03–079, <i>Mating Disruption for Management of Insect Pests</i> .
	15	Rimon 10 EC	1.4 L/1,000 L water	12 hours	14 days	Apply first spray 7 days after first adult catch in pheromone traps. Reapply at 3-week intervals. Direct spray with a handgun to cover the trunk and scaffold limbs thoroughly. Check preharvest intervals, especially for the second and third sprays.
Brown marmorated stink bug	General Comments: - Breeding populations of this pest are present in Ontario. Check ontario.ca/stinkbug for updates on pest development, registered products and management strategies. - There are currently no thresholds established. Apply when insects are first detected or early damage found.					
	4A	Clutch 50 WDG	210–420 g/ha	12 hours	7 days	Suppression only. This product is toxic to beneficial insects and should be used only when necessary.
Postharvest fruit treatment						
Blue mould, Grey mould, Brown rot, Rhizopus rot	General Comments: - Postharvest treatment may be necessary during wet harvest seasons. These treatments will prolong storage time while providing control of postharvest diseases. - See label for dip and drench instructions.					
	12	Scholar 230 SC	496 mL/378 L water	—	postharvest	No product specific comments.
	NC	Bio-Save 10 LP	500 g/100 L water	—	postharvest	Suppression only for blue mould and grey mould.
Fall spray						
Bacterial canker	General Comments: Apply when three-quarters of leaves have fallen.					
	M	Copper Spray * or Guardsman Copper Oxychloride 50 *	6–9 kg/1,000 L water	48 hours	2 days	No product specific comments.
		Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	No product specific comments.

¹ General re-entry. ² Harvest. ³ Hand thinning. — = Information not applicable or not indicated on product label. * = Potentially organic. Check with certifying body.

Table 5–2. Products Used on Sweet Cherries

Use this table as a guide but refer to product label for specific information.

The **preharvest interval** is the number of days between the last spray and first harvest.

The **restricted entry interval** is the minimum interval that must be observed between the application of the pesticide and work in the treated crop without protective equipment. If no re-entry period is stated on the label, assume it is 12 hours.

The **maximum applications** is the labelled maximum number or product amount applied for the growing season and may be higher than what is recommended for resistance management or for the preservation of beneficial insects.

Products listed as **potentially organic** may be acceptable for organic use based on *Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec publication Bulletin D'Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with certifying body to verify the acceptability of any product prior to using it.

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
Products used for insect and mite control or suppression							
Actara 25 WG	28408	thiamethoxam	4A	14 days	12 hours	2	—
Admire 240 Flowable	24094	imidacloprid	4A	7 days	24 hours	5	—
Alias 240 SC	28475	imidacloprid	4A	10 days	24 hours	5	—
Altacor	28981	chlorantraniliprole	28	1 day	12 hours	3 (max. 645 g/ha)	—
Assail 70 WP	27128	acetamiprid	4A	7 days	12 hours ¹ /6 days ²	4	—
Bioprotec CAF	26854	<i>Bacillus thuringiensis</i>	11	0 days	12 hours	—	✓
Closer	30826	sulfoxaflor	4C	7 days	12 hours	2	—
Clutch 50 WDG	29382	clothianidin	4A	7 days	12 hours	2 (max. 420 g/ha)	—
Delegate	28778	spinetoram	5	5 days	12 hours	3	—
Dipel 2X DF	26508	<i>Bacillus thuringiensis</i>	11	0 days	12 hours	—	✓
Entrust	30382	spinosad	5	3 days	when dry	3	✓
Exirel	30895	cyantraniliprole	28	3 days	12 hours	4	—
GF-120 Fruit Fly Bait	28336	spinosad	5	0 days	when dry	10	✓
Isomate-PTB Dual	30042	pheromone, peachtree borer, lesser peachtree borer	NC	—	—	—	✓
Movento 240 SC	28953	spirotetramat	23	7 days	12 hours	max. 1.12 L/ha	—
Rimon 10 EC	28881 28515	novaluron	15	14 days	12 hours	3	—
Silencer 120 EC	29052	lambda-cyhalothrin	3	7 days	24 hours	3	—
Success	26835	spinosad	5	3 days	when dry	3	—

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Plant extract. U = Mode of action has not been determined.

— = Information is not specified on the product label. ✓ = Potentially organic. Check with certifying body.

¹ General re-entry. ² Hand thinning. ³ Maximum 6 applications per season with no more than 2 dormant applications. ⁴ No more than 2 applications in the 3 weeks prior to harvest.

⁵ Depends on rate. See label. ⁶ Harvest.

Table 5–2. Products Used on Sweet Cherries (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
Products used for insect and mite control or suppression							
TwinGuard	31442	sulfoxaflor + spinetoram	4C+5	7 days	12 hours	2	—
Vegol Crop Oil	32408	canola oil	NC	0 days	12 hours	2/4 ³	✓
Products used for disease control or suppression							
Bio-Save 10 LP	29673	<i>Pseudomonas syringae</i>	NC	postharvest	—	—	—
Bravo ZN	28900	chlorothalonil	M	40 days/shuck split	48 hours	3	—
Bumper 432 EC	28017	propiconazole	3	3 days	72 hours	5 ⁴	—
Cantus WDG	30141	boscalid	7	0 days	12 hours	5	—
Copper Spray	19146	copper oxychloride	M	2 days	48 hours	2	—
Cueva	31825	copper octanoate	M	1 day	4 hours	15	—
Elevate 50 WDG	25900	fenhexamid	17	1 day	4 hours	4	—
Equal 65 WP	28351	dodine	U12	7 days	48 hours	2 ⁵	—
Fitness	32639	propiconazole	3	3 days	72 hours	5 ⁴	—
Flint	30619	trifloxystrobin	11	1 day	12 hours ¹ /4 days ²	5	—
Fontelis	30331	penthiopyrad	7	0 days	12 hours	max. 4.5 L/ha	—
Fracture	31782	BLAD polypeptide	M	0 days	12 hours	3	—
Funginex DC	27686	triforine	3	prebloom	48 hours	3	—
Guardsman Copper Oxychloride 50	13245	copper oxchloride	M	2 days	48 hours	2	✓
Indar	27294	fenbuconazole	3	1 day	12 hours	7	—
Jade	24030	propiconazole	3	3 days	72 hours	5 ⁴	—
Kasumin 2L	30591	kasugamycin	24	30 days	12 hours	4	—
Kenja 400 SC	31758	isofetamid	7	1 day	12 hours	3	—
Maestro 80 DF	26408	captan	M	2 days	48 hours	—	—
Nova	22399	myclobutanil	3	1 day	12 hours ¹ /5 days ⁶ / 12 days ²	6	—
Pristine WG	27985	boscalid + pyraclostrobin	7+11	1 day	when dry ¹ / 24 hours ⁶ / 10 days ²	5	—
Quash	30402	metconazole	3	14 days	12 hours ¹ /9 days ²	1	—

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Plant extract. U = Mode of action has not been determined.

— = Information is not specified on the product label. ✓ = Potentially organic. Check with certifying body.

¹ General re-entry. ² Hand thinning. ³ Maximum 6 applications per season with no more than 2 dormant applications. ⁴ No more than 2 applications in the 3 weeks prior to harvest.

⁵ Depends on rate. See label. ⁶ Harvest.

Table 5–2. Products Used on Sweet Cherries (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
Products used for disease control or suppression							
Regalia Maxx	30199	extract of <i>Reynoutria sachalinensis</i>	P5	0 days	when dry	—	✓
Rovral WP	15213	iprodione	2	1 day	12 hours	—	—
Scholar 230 SC	29528	fludioxonil	12	postharvest	—	1	—
Senator 50 SC	32096	thiophanate-methyl	1	1 day	12 hours	max. 4.9 L/ha	—
Sercadis	31697	fluxapyroxad	7	0 days	12 hours	3	—
Serenade OPTI	31666	<i>Bacillus subtilis</i>	44	0 days	when dry	—	✓
Supra Captan 80 WDG	24613	captan	M	2 days	48 hours	—	—
Syllit 400 FL	28351	dodine	U12	7 days	48 hours	4	—
Tilt 250 E	19346	propiconazole	3	3 days	72 hours	5 ⁴	—
Thinners and plant growth regulators							
Apogee	28042	prohexadione calcium	NC	20 days	12 hours	2	—
Falgro Tablet	27653	gibberellic acid	NC	21 days	12 hours	—	—
ProGibb 40 SG	29359	gibberellin A ₃	NC	21 days	12 hours	—	—

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Plant extract. U = Mode of action has not been determined.

— = Information is not specified on the product label. ✓ = Potentially organic. Check with certifying body.

¹ General re-entry. ² Hand thinning. ³ Maximum 6 applications per season with no more than 2 dormant applications. ⁴ No more than 2 applications in the 3 weeks prior to harvest.

⁵ Depends on rate. See label. ⁶ Harvest.

TART CHERRY CALENDAR

In this section:

- Read the product label and follow all safety precautions. 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>.
- Consult the product label for suggested water volumes. Otherwise, use enough water to ensure thorough spray coverage. Where the product rate is listed in amount per 1,000 L and if a water volume is not provided on the label, use enough water to wet the foliage to the near drip point.
- For preharvest interval, restricted entry interval, and maximum number of applications, see Table 5–3. *Products Used on Tart Cherries*, page 285.
- **Products are listed by chemical group and in alphabetical order within each group. The order does not reflect efficacy.** See Table 5–7. *Activity of Fungicides on Tender Fruit Diseases and Impact on Honeybees*, page 340 and Table 5–8. *Activity of Insecticides and Miticides on Tender Fruit Pests and Impact on Honeybees*, page 343, for efficacy ratings.
- Where a product in the calendar is followed by a “*”, it is potentially acceptable for organic use based on *Ministère de l’Agriculture, des Pêcheries et de l’Alimentation du Québec publication Bulletin D’Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with your certifying body to verify the acceptability of any product prior to using it.
- Information on the timing and rates of application for plant growth regulators and chemical thinners can be found in the crop calendars. For additional information on plant growth regulators and thinning, visit http://www.omafra.gov.on.ca/english/crops/hort/tender_fruit.html and click on *Plant Growth Regulators for Fruit Crops* and *Thinning of Tree Fruit*.

Resistance Management

To delay development of resistance to insecticides, miticides and fungicides, follow resistance management guidelines outlined in *Resistance Management Strategies*, page 393. The chemical group is indicated in the column labelled “Group” before the “Product” column. Products belonging to the same chemical group are grouped together in the calendar. Multi-site (M) fungicides are not prone to resistance and do not have to be rotated. Some products are not classified to mode of action (NC) and the mode of action has not been determined for others (U or UN). Group 44 and 46 fungicides are not known to be prone to resistance.

Fungicide resistance management

Take the following steps to avoid rapid development of fungicide resistance:

- Do not reduce rates below those specified on the label.
- Do not use products containing the same chemical group in consecutive applications.
- Do not use Senator, Rovral, Bumper, Jade, Tilt, Funginex, Indar, Nova, Quash, Cantus, Fontelis, Kenja, Sercadis, Pristine, Elevate, Cabrio, Flint, Quintec, Elevate, Vivando or Equal when sporulating lesions of the target disease are present.
- Do not exceed maximum number of applications on the label.

Insecticide resistance management

Take the following steps to avoid development of insecticide resistance:

- For pests with discrete generations (plum curculio, obliquebanded leafroller), do not use insecticides from the same group for more than one generation. Within a generation, if more than one spray is required, use a product from the same chemical group.
- For pests with overlapping generations (aphids, mites, cherry fruit fly), do not use products containing the same chemical group in consecutive applications.

Bee Toxicity

Some insecticides are toxic to bees and other pollinating insects. Use of insecticides on flowering crops requires careful management to avoid negative effects on pollinators. Some insecticides cannot be applied prior to or during bloom. Insecticides should not be applied when tree fruit are in bloom. Do not apply insecticides when bees are active. Before and after bloom, bees may be present on flowering cover crops and weeds—do not allow drift of insecticides onto these or other flowering crops. Always follow label precautions to avoid impacts on bees. For more information, see *Bee Poisoning*, page 5, and honeybee toxicity ratings in Table 5–7. *Activity of Fungicides on Tender Fruit Diseases and Impact on Honeybees*, page 340, and Table 5–8. *Activity of Insecticides and Miticides on Tender Fruit Pests and Impact on Honeybees*, page 343.

Buffer Zones

Leave a suitable buffer zone between treatment area and adjacent sensitive areas, such as hedgerows, woodlots and freshwater habitats. Zones may vary depending on the product used, growth stage of the crop and method of application including the use of drift-reducing technology. Check the pesticide label for requirements.

Use Health Canada’s online spray drift calculator to modify the buffer zone specified on the label based on weather conditions, category of spray equipment and 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. Unfortunately, this model does not account for carrier volume, travel speed or crop stage.

Observing buffer zones is a legal requirement. A record of the buffer zone modification, if any, must be retained for at least one year from the time of application.

Crop Nutrition

Crop nutrition is important for plant growth, fruit quality development and the acquisition of adequate cold hardiness by tree fruit. For fruit crops, soil testing, plant tissue analysis and visual deficiency symptoms all play an important role in assessing and monitoring the crop's nutritional status. For more information, visit http://www.omafra.gov.on.ca/english/crops/hort/tender_fruit.html (click on *Soil Management, Fertilizer Use, Crop Nutrition and Cover Crops for Fruit Production*) and see OMAFRA Publication 611, *Soil Fertility Handbook*. For soil testing For soil testing and plant tissue analysis services, see Appendix E: *Accredited Soil-Testing Laboratories in Ontario*, page 435.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Dormant (before bud break)						
Bacterial canker	General Comments: • Apply in early spring before bud break. Later applications may cause injury. • Use low rate on small trees and high rate on large trees.					
	M	Copper Spray * or Guardsman Copper Oxychloride 50 *	6–9 kg/1,000 L water	48 hours	2 days	No product specific comments.
		Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	No product specific comments.
Black knot	Prune out, remove and burn all black knots from commercial orchards during dormant period before bud break. Remove any wild infected cherry hosts surrounding commercial orchards.					
Prebloom						
European red mite	General Comments: • Needed only in tart cherry orchards with a history of heavy mite populations. • Spray as buds are breaking. • Tolerance has not been determined for all varieties. Test a small area of each variety prior to spraying the whole block. • Apply in a high-volume spray to ensure thorough coverage. Mature trees require water volumes of approximately 3,000 L/ha. • Do not use within 14 days of Supra Captan or Maestro. • Do not apply within 48 hours of freezing temperatures, when temperatures are high (over 30°C), prior to rain or to heat- or moisture-stressed trees.					
	NC	Purespray Green Spray Oil 13 E *	20 L/1,000 L water	12 hours	prebloom	Do not use within 14 days of Bravo, Echo or sulphur.
		Superior 70 Oil *	20 L/1,000 L water	12 hours	prebloom	Do not use within 30 days of sulphur.
		Vegol Crop Oil *	20 L/1,000 L water	12 hours	0 days	Do not use within 14 days of copper and 30 days of sulphur. Do not apply to wet foliage.

¹ General re-entry. ² Hand harvesting. ³ Hand thinning. ⁴ Preharvest interval is 0 days for mechanical harvest or 1 day for hand harvest. ⁵ Pruning.
 — = Information is not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Bloom						
DO NOT APPLY INSECTICIDES WHILE CHERRY TREES ARE IN BLOOM. SEE BEE POISONING, PAGE 5.						
Brown rot (blossom blight stage)	General Comments: - Spray when first blooms open if weather conditions are expected to be wet and warm (above 16°C) during bloom. Tart cherries are less susceptible to brown rot than sweet cherries. One application during bloom should be sufficient, unless frequent wet periods occur and brown rot pressure is high. - Group 1, 2, 3, 7, 11 and 17 fungicides are locally systemic. Consult labels for information on drying time required before rain.					
	M	Bravo ZN or Echo 90 DF	7 L/ha 2.8–5.0 kg/ha	48 hours	40 days/ shuck split	Make 1–3 applications from white bud through shuck split. Use higher rate for trees greater than 6 m in height or if weather is warm (above 16°C) and wet during bloom. Do not use within 14 days of Purespray Green Spray Oil. Do not tank-mix or make sequential applications with Exirel.
		Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	Do not mix with lime. May cause some defoliation. During excessive moisture and cold, leaf spots can appear on copper-sensitive crops. If concerned about tree sensitivity, test first on a small area.
		Fracture	1.5–3.3 L/ha	12 hours	0 days	Under high disease pressure, use high rate. Do not mix with foliar fertilizers.
		Kumulus DF * or Microthiol Disperss *	22.5 kg/ha	24 hours	1 day	Do not use within 14 days of Purespray Green Spray Oil and 30 days of Vegol Crop Oil or Superior Oil.
		Maestro 80 DF or Supra Captan 80 WDG	4.5 kg/ha	48 hours	5 days	Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Fontelis or Exirel.
	1	Senator 50 SC	2.45 L/ha	12 hours	1 day	No product specific comments.
	2	Rovral WP	1.5 kg/ha	12 hours	1 day	No product specific comments.
	3	Bumper 432 EC or Fitness or Jade or Tilt 250 E	300 mL/ha 300 mL/ha 500 mL/ha 500 mL/ha	12 hours 72 hours 72 hours 72 hours	3 days	Also suppresses black knot.
		Funginex DC	2.5 L/ha	48 hours	prebloom	No product specific comments.
		Indar	140 g/ha	12 hours	1 day	No product specific comments.
		Nova	340 g/ha	12 hours ¹ / 5 days ² /12 days ³	1 day	No product specific comments.
		Quash	175–245 g/ha	12 hours ¹ /9 days ³	14 days	Under high disease pressure, use high rate.
	7	Cantus WDG	370 g/ha	12 hours	0 days	No product specific comments.
		Fontelis	1.0–1.75 L/ha	12 hours	0 days	Contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
		Kenja 400 SC	913 mL/ha	12 hours	1 day	Suppression only. Use with a silicone surfactant. See Table 5–9. <i>Adjuvants Used in Ontario</i> , page 346.
		Sercadis	333 mL/ha	12 hours	0 days	Use a non-ionic surfactant at a rate of 0.125% v/v (1.25 L in 1,000 L water). See Table 5–9. <i>Adjuvants Used in Ontario</i> , page 346.

¹ General re-entry. ² Hand harvesting. ³ Hand thinning. ⁴ Preharvest interval is 0 days for mechanical harvest or 1 day for hand harvest. ⁵ Pruning.

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Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Bloom						
DO NOT APPLY INSECTICIDES WHILE CHERRY TREES ARE IN BLOOM. SEE BEE POISONING, PAGE 5.						
Brown rot (blossom blight stage) (cont'd)	7+11	Pristine WG	750 g/ha	when dry ¹ / 24 hours ² /10 days ³	0 days/1 day ⁴	No product specific comments.
	17	Elevate 50 WDG	1.7 kg/ha	4 hours	1 day	No product specific comments.
	44	Serenade OPTI *	1.1–1.7 kg/ha	when dry	0 days	Suppression only.
	P5	Regalia Maxx *	0.125–0.25% v/v in 500– 1,000 L water/ha	when dry	0 days	Suppression only. Apply before symptoms develop. Use 0.125% (1.25 L in 1,000 L water) in a tank-mix with other brown rot fungicides or 0.25% (2.5 L in 1,000 L water) in rotation with other brown rot fungicides.
Terminal growth management	NC	Apogee	450 g/1,000 L water	12 hours	20 days	Can be used to reduce terminal growth. Once applied, requires two weeks to slow growth effectively. Make the first application when terminal shoots are no longer than 2.5–5 cm (approximately late bloom). If required, make a second application 14–21 days later. Do not tank mix with calcium products. The use of a non-ionic surfactant and ammonium sulphate conditioner is recommended. See label and Table 5–9. <i>Adjuvants Used in Ontario</i> , page 346, for more details. Effects on fruit set, size and yield vary among cultivars. Resurgence in late-season growth may occur in some situations. For additional information, visit http://www.omafra.gov.on.ca/english/crops/hort/tender_fruit.html and click on <i>Plant Growth Regulators for Fruit Crops</i> .
Petal fall						
Leaf spot	General Comments: - Spray only if rain is forecast between Bloom and Shuck split sprays. - Group 3, 7, 11 and U12 fungicides are locally systemic. Consult labels for information on drying time required before rain.					
	M	Bravo ZN or Echo 90 DF	7 L/ha 2.8–5.0 kg/ha	48 hours	40 days/ shuck split	Make 1 application for early season leaf spot. Do not use within 14 days of Purespray Green Spray Oil. Do not tank-mix or make sequential applications with Exirel.
		Ferbam 76 WDG	1.75–2 kg/ 1,000 L water	12 hours	4 days	No product specific comments.
		Maestro 80 DF or Supra Captan 80 WDG	4.5 kg/ha	48 hours	5 days	Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Fontelis or Exirel.
	3	Bumper 432 EC or Fitness or Jade or Tilt 250 E	300 mL/ha 300 mL/ha 500 mL/ha 500 mL/ha	12 hours 72 hours 72 hours 72 hours	3 days	Apply in a minimum of 500 L water/ha.
		Nova	340 g/ha	12 hours ¹ / 5 days ² /12 days ³	1 day	No product specific comments.
		Quash	280 g/ha	12 hours ¹ /9 days ³	14 days	No product specific comments.

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Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Petal fall						
Leaf spot (cont'd)	7	Fontelis	1.5 L/ha	12 hours	0 days	Suppression only. Contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
	7+11	Pristine WG	750 g/ha	when dry ¹ / 24 hours ² /10 days ³	0 days/1 day ⁴	No product specific comments.
	11	Flint	210 g/ha	12 hours ¹ /4 days ³	1 day	Do not apply where spray drift may reach Concord grapes as it may cause crop injury.
	P5	Regalia Maxx *	0.125–0.25% v/v in 500– 1,000 L water/ha	when dry	0 days	Suppression only. Apply before symptoms develop. Use 0.125% (1.25 L in 1,000 L water) in a tank-mix with other leaf spot fungicides or 0.25% (2.5 L in 1,000 L water) in rotation with other leaf spot fungicides.
	U12	Equal 65 WP or Syllit 400 FL	2.25 kg/ha 2 L/ha	48 hours	7 days	No product specific comments.
Black knot	General Comments: • This spray is needed only on tart cherry orchards with a history of black knot.					
	M	Bravo ZN or Echo 90 DF	7 L/ha 3.4–5.0 kg/ha	48 hours	40 days/ shuck split	Do not use within 14 days of Purespray Green Spray Oil. Do not tank-mix or make sequential applications with Exirel.
	3	Bumper 432 EC or Fitness or Jade or Tilt 250 E	300 mL/ha 300 mL/ha 500 mL/ha 500 mL/ha	12 hours 72 hours 72 hours 72 hours	3 days	Suppression only. These products are locally systemic. Consult labels for information on drying time required before rain.
		Indar	140 g/ha	12 hours	1 day	This product is locally systemic. Consult labels for information on drying time required before rain.
Terminal growth management	Use one of the products listed for Terminal growth management at Bloom .					
Shuck split						
Plum curculio	General Comments: • Spray when most shucks are off and plum curculio activity is observed. • These products are toxic to bees. Do not apply when bees are active or hives are in the orchard. Refer to label for specific bee toxicity statements.					
	1	Imidan WP	2.68 kg/ha	72 hours	7 days	No product specific comments.
	3	Silencer 120 EC	104 mL/ha	24 hours	7 days	Under high pressure, may provide suppression rather than control. Apply when fruit is the size of a pea, and 10–12 days later if oviposition scars are detected.
	4A	Assail 70 WP	240 g/ha	12 hours ¹ /6 days ³	7 days	Under high pressure, may provide suppression rather than control.
		Clutch 50 WDG	210 g/ha	12 hours	7 days	No product specific comments.
	28	Exirel	1.0–1.5 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.

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Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Shuck split						
Brown rot	General Comments: Group 2, 3, 7, 11 and 17 fungicides are locally systemic. Consult labels for information on drying time required before rain.					
	M	Bravo ZN or Echo 90 DF	7 L/ha 2.8–5.0 kg/ha	48 hours	40 days/ shuck split	Do not apply after Shuck split to avoid fruit injury. Make 1–3 applications from white bud through shuck split. Use higher rate for trees greater than 6 m in height or if weather is warm (above 16°C) and wet during bloom. Do not use within 14 days of Purespray Green Spray Oil. Do not tank-mix or make sequential applications with Exirel.
		Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	Do not mix with lime. May cause some defoliation. During excessive moisture and cold, leaf spots can appear on copper-sensitive crops. If concerned about tree sensitivity, test first on a small area.
		Fracture	1.5–3.3 L/ha	12 hours	0 days	Under high disease pressure, use high rate. Do not mix with foliar fertilizers.
		Maestro 80 DF or Supra Captan 80 WDG	4.5 kg/ha	48 hours	5 days	Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Fontelis or Exirel.
	2	Rovral WP	1.5 kg/ha	12 hours	1 day	No product specific comments.
	3	Bumper 432 EC or Fitness or Jade or Tilt 250 E	300 mL/ha 300 mL/ha 500 mL/ha 500 mL/ha	12 hours 72 hours 72 hours 72 hours	3 days	No product specific comments.
		Indar	140 g/ha	12 hours	1 day	No product specific comments.
		Quash	175–280 g/ha	12 hours ¹ /9 days ³	14 days	Under high disease pressure, use high rate.
	7	Cantus WDG	370 g/ha	12 hours	0 days	No product specific comments.
		Fontelis	1.0–1.75 L/ha	12 hours	0 days	Contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
		Kenja 400 SC	319 mL/ha	12 hours	1 day	Suppression only. Use with a silicone surfactant. See Table 5–9, <i>Adjuvants Used in Ontario</i> , page 346.
	7+11	Pristine WG	750 g/ha	when dry ¹ / 24 hours ² / 10 days ³	0 days/1 day ⁴	No product specific comments.
	17	Elevate 50 WDG	1.7 kg/ha	4 hours	1 day	No product specific comments.
	44	Serenade OPTI *	1.1–1.7 kg/ha	when dry	0 days	Suppression only.
	P5	Regalia Maxx *	0.125–0.25% v/v in 500–1,000 L water/ha	when dry	0 days	Suppression only. Apply before symptoms develop. Use 0.125% (1.25 L in 1,000 L water) in a tank-mix with other brown rot fungicides or 0.25% (2.5 L in 1,000 L water) in rotation with other brown rot fungicides.

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Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Shuck split						
Leaf spot	Use one of the fungicides listed for Leaf spot at Petal fall with the exception of Ferbam. Do not use Bravo or Echo after Shuck split .					
Black knot	Use one of the fungicides listed for Black knot at Petal fall . This spray is needed only in orchards with a history of black knot. Spore release may be delayed in dry springs. Under these conditions, extend fungicide coverage to First cover . Do not use Bravo or Echo after Shuck split .					
Production management	NC	Falgro Tablet	10–15 tablets/ 1,000 L water	12 hours	21 days	To moderate early production, apply in fourth year. This avoids heavy bloom and overproduction in year 5. Apply from shuck fall to 2 weeks after shuck fall. Use concentrations of 10–20 ppm (15 ppm is most common). Use lower rates on more vigorous trees. Do not use on stressed trees. Apply product as a mist during slow drying conditions. Rates vary with age and vigour of the tree. See label for more information. For trees infected with cherry yellows virus, apply annually to maintain and extend fruiting capacity. For additional information, visit http://www.omafra.gov.on.ca/english/crops/hort/tender_fruit.html and click on <i>Plant Growth Regulators for Fruit Crops</i> .
		ProGibb 40 SG	23–37.5 g/ 1,000 L water	12 hours	21 days	
First cover (12 days after Shuck split)						
Powdery mildew	General Comments: • Cover sprays applied after Shuck split are critical for powdery mildew control.					
	M	Kumulus DF * or Microthiol Disperss *	12 kg/ha	24 hours	1 day	Do not use within 14 days of Purespray Green Spray Oil and 30 days of Vegol Crop Oil.
	3	Nova	340 g/ha	12 hours ¹ / 5 days ² /12 days ³	1 day	No product specific comments.
		Quash	245–280 g/ha	12 hours ¹ /9 days ³	14 days	Suppression only.
	7	Fontelis	1.0–1.75 L/ha	12 hours	0 days	Contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
	7+11	Pristine WG	750 g/ha	when dry ¹ / 24 hours ² /10 days ³	0 days/1 day ⁴	Suppression only.
	11	Cabrio EG	670 g/ha	12 hours ¹ /9 days ^{3,5}	10 days	No product specific comments.
		Flint	210 g/ha	12 hours ¹ /4 days ³	1 day	Do not apply where spray drift may reach Concord grapes.
	13	Quintec	500 mL/ha	12 hours	7 days	No product specific comments.
	U8	Vivando SC	0.75–1.12 L/ha	12 hours	7 days	No product specific comments.
	NC	Vegol Crop Oil *	2% v/v	12 hours	0 days	Suppression only. Apply in a high-volume spray to ensure thorough coverage at a rate of 2% v/v (20 L/1,000 L water). Tolerance has not been determined for all varieties. Test a small area of each variety prior to spraying the whole block. Do not use within 48 hours of freezing temperatures, when temperatures are high (over 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of Supra Captan, Maestro or copper product and 30 days of sulphur product. Do not apply to wet foliage.

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Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
First cover (12 days after Shuck split)						
Leaf spot	Use one of the fungicides listed for Leaf spot at Petal fall with the exception of Ferbam, Bravo or Echo.					
Obliquebanded leafroller	General Comments: - Routine monitoring is necessary to determine if obliquebanded leafroller is causing damage in tart cherries. Reapply 10 days later if emergence is extended. - Apply insecticide at 240–280 DDC (base 7.2°C) after first sustained moth catch unless otherwise indicated. For information on calculating degree days, see Appendix B: <i>Degree-Day Modeling</i>, page 428.					
	4C+5	TwinGuard	250–500 g/ha	12 hours	7 days	No product specific comments.
	5	Entrust * or Success	364 mL/ha 182 mL/ha	when dry	3 days	No product specific comments.
	11	Bioprotec CAF * or Dipel 2X DF *	4 L/ha 1.125 kg/ha	12 hours	0 days	Product must be consumed to be effective. Spray when and where pests are actively feeding. Apply in a high-volume spray to ensure thorough coverage on both sides of the leaf. Apply to young larvae, early in infestation. Death of insect may take several days. Reapply at 5–7-day intervals if larvae activity is extended. Acidify spray mix to below pH 7.0 and apply on cloudy days or in the evening.
	15	Rimon 10 EC	1.35–3.35 L/ha	12 hours	14 days	No product specific comments.
	18	Intrepid	750 mL/ha	12 hours	7 days	No product specific comments.
	28	Altacor	285 g/ha	12 hours	1 day	No product specific comments.
	28	Exirel	0.5–1.0 L/ha	12 hours	3 days	Apply at first egg hatch, or 170–240 DDC (base 7.2°C). Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
	Plum curculio	Use one of the insecticides listed for Plum curculio at Shuck split . Monitor 7 days after the insecticide at Shuck split for new plum curculio damage. Reapply if new crescent-shaped cuts on fruit are found.				
Special sprays (when monitoring indicates the need)						
European red mite	General Comments: - Apply in a high-volume spray to ensure thorough coverage. - Treatment is needed only in heavily infested orchards.					
	21	Nexter	300 g/ha	24 hours	7 days	No product specific comments.
	22	Envirdor 240 SC	750 mL/ha	12 hours	7 days	Control may not be apparent for 2–3 weeks. Apply before mite populations build up.
	NC	Vegol Crop Oil *	2% v/v	12 hours	0 days	See comments on this product for European red mite in Prebloom .

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Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Second cover (12 days after First cover)						
Cherry fruit fly	General Comments: - On early varieties, check preharvest interval. - Spray when early varieties are beginning to colour. A second application may be required 10 days later. - Cherry fruit fly and spotted wing drosophila (SWD) are attracted to fruit as soon as they turn from green to yellow. Start sprays at that point. - Use a product for cherry fruit fly that is also active against SWD if present in the area. See Table 5–8. <i>Activity of Insecticides and Miticides on Tender Fruit Pests and Impact on Honeybees</i>, page 343.					
	1	Imidan WP	2.68 kg/ha	72 hours	7 days	No product specific comments.
	3	Silencer 120 EC	104 mL/ha	24 hours	7 days	No product specific comments.
	4A	Admire 240 Flowable or Alias 240 SC	230 mL/ha 233 mL/ha	24 hours	7 days 10 days	No product specific comments.
		Assail 70 WP	240 g/ha	12 hours ¹ /6 days ³	7 days	No product specific comments.
	5	Delegate	420 g/ha	12 hours	5 days	Suppression only. Use if needed for obliquebanded leafroller control.
		Entrust *	364 mL/ha	when dry	3 days	Apply within 6 days of first fly emergence. Allow 5–7 days between applications, shortening the application interval during rainy periods and as fruit ripens
		GF-120 Fruit Fly Bait *	1.5 L/ha	when dry	0 days	Spray as soon as monitoring traps indicate flies are present or 2–3 weeks before ripening. Reapply every 7 days, or sooner if rain or overhead irrigation washes off residue. Large droplet sizes optimize the attractiveness of the bait. Proper application techniques help ensure adequate coverage. Apply using an all-terrain vehicle fitted with an appropriate sprayer and nozzle for a large spray droplet size of 4–6 mm directed to underside of leaves and inside the canopy.
	28	Altacor	285 g/ha	12 hours	1 day	Suppression only. Use if needed for obliquebanded leafroller control.
		Exirel	0.75–1.5 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
Spotted wing drosophila	General Comments: - Spotted wing drosophila insert eggs into ripening fruit. Larvae develop in the fruit and may be present at harvest, contributing to premature breakdown. - Weekly insecticides are recommended when fruit is ripening or ripe, and flies are present. - Burial of grade-out fruit and general sanitation are very important to prevent problems. - These products rely on contact in order to control spotted wing drosophila adults. Apply in a high-volume spray to ensure thorough coverage of fruit.					
	1	Imidan WP	2.68 kg/ha	72 hours	7 days	No product specific comments.
	5	Delegate	420 g/ha	12 hours	5 days	No product specific comments.
	28	Exirel	1.0–1.5 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.

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Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Second cover (12 days after First cover)						
Plum curculio	Use one of the insecticides listed for Plum curculio at Shuck split .					
Obliquebanded leafroller	Use one of the insecticides listed for Obliquebanded leafroller at First cover . Routine monitoring is necessary to determine if obliquebanded leafrollers are causing damage in tart cherries.					
Leaf spot	Use one of the fungicides listed for Leaf spot at Petal fall with the exception of Ferbam, Bravo or Echo.					
Powdery mildew	Use one of the fungicides listed for Powdery mildew at First cover .					
Third cover						
Check preharvest interval before spraying early maturing cherries. See Table 5–3. <i>Products Used on Tart Cherries</i> , page 285.						
Cherry fruit fly, Spotted wing drosophila	Use one of the insecticides listed for Cherry fruit fly at Second cover . In orchards where spotted wing drosophila has been trapped, use a product that has activity on both pests. See Table Table 5–8. <i>Activity of Insecticides and Miticides on Tender Fruit Pests and Impact on Honeybees</i> , page 343.					
Brown rot	Use one of the fungicides listed for Brown rot at Shuck split with the exception of Ferbam, Bravo or Echo. Rotate among fungicide groups for resistance management.					
Leaf spot	Use one of the fungicides listed for Leaf spot at Petal fall with the exception of Ferbam, Bravo and Echo. For Bumper, Fitness, Jade or Tilt, make a 2nd and 3rd application at 7–10-day interval in the 3 weeks prior to harvest. Do not apply more than 2 consecutive applications.					
Special sprays (when monitoring indicates the need)						
European red mite	23	Envidor 240 SC	750 mL/ha	12 hours	7 days	Control may not be apparent for 2–3 weeks. Apply before mite populations build up.
	NC	Vegol Crop Oil *	2% v/v	12 hours	0 days	See comments on this product for European red mite in Prebloom .
Preharvest						
Check preharvest interval before spraying early maturing cherries. See Table 5–3. <i>Products Used on Tart Cherries</i> , page 285.						
Brown rot	Use one of the fungicides listed for Brown rot at Shuck split with the exception of Ferbam, Bravo or Echo. Rotate among fungicide groups for resistance management.					
Cherry fruit fly, Spotted wing drosophila	Use one of the insecticides listed for Cherry fruit fly at Second cover . In orchards where spotted wing drosophila has been trapped, use a product that has activity on both pests. Refer to Table 5–8. <i>Activity of Insecticides and Miticides on Tender Fruit Pests and Impact on Honeybees</i> , page 343.					
Fruit quality	NC	Ethrel	2.75 L in 2,400 L water/ha	48 hours	—	Loosens fruit to facilitate mechanical harvesting. Apply when fruit are enlarging rapidly, with the grass-green colour beginning to turn yellow or developing a tinge of red. This generally coincides with 7–14 days before anticipated harvest. Concentrate sprays (1,000 L of water per ha or less) achieve the same level of loosening as dilute applications. Uniform coverage is important. Efficacy depends on tree vigour, health, rate and temperature. Do not tank-mix with foliar nutrients or compounds such as fruit-cracking inhibitors. Apply only when temperature is 18–30°C. For additional information, visit http://www.omafra.gov.on.ca/english/crops/hort/tender_fruit.html and click on <i>Plant Growth Regulators for Fruit Crops</i> .

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Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Postharvest						
Leaf spot	General Comments: Necessary where leaf spot is a problem.					
	M	Bravo ZN or Echo 90 DF	7 L/ha 2.8–5.0 kg/ha	48 hours	—	Apply once to foliage 1–7 days after fruit is removed. In orchards with high leaf spot incidence, reapply 10–14 days later. Do not use within 14 days of Purespray Green Spray Oil. Do not tank-mix or make sequential applications with Exirel.
		Cueva	1% v/v in 470–940 L water	4 hours	—	Apply as a dormant spray in late fall during a period of dry weather.
		Maestro 80 DF or Supra Captan 80 WDG	4.5 kg/ha	48 hours	—	Apply as a dormant spray in late fall during a period of dry weather.
	3	Nova	340 g/ha	12 hours ¹ /5 days ² / 12 days ³	—	No product specific comments.
	7+11	Pristine WG	750 g/ha	when dry ¹ / 24 hours ² /10 days ³	—	No product specific comments.
	11	Flint	210 g/ha	12 hours ¹ /4 days ³	—	Do not apply where spray drift may reach Concord grapes.
	U12	Equal 65 WP or Syllit 400 FL	2.25 kg/ha 2 L/ha	48 hours	—	No product specific comments.
Powdery mildew	P5	Regalia Maxx *	0.125–0.25% v/v in 500–1,000 L water/ha	when dry	—	Suppression only. Apply before symptoms develop. Use 0.125% (1.25 L in 1,000 L water) in a tank-mix with other leaf spot fungicides or 0.25% (2.5 L in 1,000 L water) in rotation with other leaf spot fungicides.
	7+11	Pristine WG	750 g/ha	when dry ¹ / 24 hours ² /10 days ³	—	Suppression only.
	11	Cabrio EG	670 g/ha	12 hours ¹ /9 days ^{3,5}	—	No product specific comments.
	13	Quintec	500 mL/ha	12 hours	—	No product specific comments.
	NC	Vegol Crop Oil *	2% v/v	12 hours	—	Suppression only. See comments on this product for Powdery mildew at First cover .
	P5	Regalia Maxx *	0.125–0.25% v/v in 500–1,000 L water/ha	when dry	—	Suppression only. Apply before symptoms develop. Use 0.125% (1.25 L in 1,000 L water) in a tank-mix with other powdery mildew fungicides or 0.25% (2.5 L in 1,000 L water) in rotation with powdery mildew fungicides.
	U8	Vivando SC	0.75–1.12 L/ha	12 hours	—	No product specific comments.

¹ General re-entry. ² Hand harvesting. ³ Hand thinning. ⁴ Preharvest interval is 0 days for mechanical harvest or 1 day for hand harvest. ⁵ Pruning.

— = Information is not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Special sprays (when monitoring indicates the need)						
Aphids	General Comments: • These may be added to a compatible fungicide after bloom. • Thorough coverage and a calm warm day are necessary for good aphid control.					
	4A	Admire 240 Flowable	230 mL/ha	24 hours	7 days	No product specific comments.
		Clutch 50 WDG	210 g/ha	12 hours	7 days	No product specific comments.
	4C	Closer	100–200 mL/ha	12 hours	7 days	Where possible, rotate with products outside of Group 4.
	23	Movento 240 SC	365 mL/ha	12 hours	7 days	Most effective on young stages of aphids. Control may not be apparent for 2–3 weeks. Under high pressure, a second application may be necessary 2 weeks later. Tank-mix with an adjuvant/additive that has spreading and penetrating properties at a suggested rate of 0.2% v/v (2 L/1,000 L water). See label and Table 5–9, <i>Adjuvants Used in Ontario</i> , page 346, for further details. Do not tank-mix with sulphur.
	29	Beleaf 50 SG	120–160 g/ha	12 hours ¹ / 48 hours ³	14 days	Use high rate for high pressure and/or dense foliage.
	NC	Vegol Crop Oil *	2% v/v	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage at a rate of 2% v/v (20 L/1,000 L water). Tolerance has not been determined for all varieties. Test a small area of each variety prior to spraying the whole block. Do not use within 48 hours of freezing temperatures, when temperatures are high (over 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of Supra Captan, Maestro or copper product and 30 days of sulphur product. Do not apply to wet foliage.
Peachtree borer, Lesser peachtree borer	NC	Isomate-PTB Dual *	375 dispensers/ha	—	—	Reduces mating of peachtree and lesser peachtree borer. Apply before moth emergence begins (i.e., typically at or before Shuck split). Dispensers are designed to last the entire season. At high-pressure sites, insecticides may be needed as long as the maximum labelled rate is not exceeded. For more information on mating disruption, see OMAFRA Factsheet 03–079, <i>Mating Disruption for Management of Insect Pests</i> .
	15	Rimon 10 EC	1.4 L/1,000 L water	12 hours	14 days	If mating disruption is not used, apply first spray 7 days after adult catch in pheromone trap. Reapply at 3-week intervals. Direct these sprays with a handgun to cover trunk and scaffold limbs thoroughly. Check preharvest intervals, especially for the second and third sprays.
Brown marmorated stink bug	General Comments: • Breeding populations of this pest are present in Ontario. Check ontario.ca/stinkbug for updates on pest development, registered products and management strategies. • There are currently no thresholds established. Apply when insects are first detected or early damage found.					
	4	Clutch 50 WDG	210–420 g/ha	12 hours	7 days	Suppression only. This product is toxic to beneficial insects and should only be used when necessary.

¹ General re-entry. ² Hand harvesting. ³ Hand thinning. ⁴ Preharvest interval is 0 days for mechanical harvest or 1 day for hand harvest. ⁵ Pruning.

— = Information is not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Fall spray						
Cherry leaf spot	U12	Syllit 400 FL	2 L/ha	48 hours	7 days	No product specific comments.
Bacterial canker	General Comments: • Apply when three-quarters of leaves have fallen.					
	M	Copper Spray * or Guardsman Copper Oxychloride 50 *	6–9 kg/1,000 L water	48 hours	2 days	No product specific comments.
		Cueva	1% v/v in 470– 940 L water/ha	4 hours	1 day	No product specific comments.

¹ General re-entry. ² Hand harvesting. ³ Hand thinning. ⁴ Preharvest interval is 0 days for mechanical harvest or 1 day for hand harvest. ⁵ Pruning.

— = Information is not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 5–3. Products Used on Tart Cherries

Use this table as a guide but refer to product label for specific information.

The **preharvest interval** is the number of days between the last spray and first harvest.

The **restricted entry interval** is the minimum interval that must be observed between the application of the pesticide and work in the treated crop without protective equipment. If no re-entry period is stated on the label, assume it is 12 hours.

The **maximum applications** is the labelled maximum number or product amount applied for the growing season and may be higher than what is recommended for resistance management or for the preservation of beneficial insects.

Products listed as **potentially organic** may be acceptable for organic use based on *Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec publication Bulletin D'Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with certifying body to verify the acceptability of any product prior to using it.

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
Products used for insect and mite control or suppression							
Admire 240 Flowable	24094	imidacloprid	4A	7 days	24 hours	5	—
Alias 240 SC	28475	imidacloprid	4A	10 days	24 hours	5	—
Altacor	28981	chlorantraniliprole	28	1 day	12 hours	3 (max. 645 g/ha)	—
Assail 70 WP	27128	acetamiprid	4A	7 days	12 hours ¹ /6 days ²	4	—
Beleaf 50 SG	29796	flonicamid	29	14 days	12 hours ¹ /48 hours ²	3	—
Bioprotec CAF	26854	<i>Bacillus thuringiensis</i>	11	0 days	12 hours	—	✓
Closer	30826	sulfoxaflor	4C	7 days	12 hours	2	—
Clutch 50 WDG	29382	clothianidin	4A	7 days	12 hours	2 (max. 420 g/ha)	—
Delegate	28778	spinetoram	5	5 days	12 hours	3	—
Dipel 2X DF	26508	<i>Bacillus thuringiensis</i>	11	0 days	12 hours	—	✓
Entrust	30382	spinosad	5	3 days	when dry	3	✓
Envior 240 SC	28051	spirodiclofen	23	7 days	12 hours	1	—
Exirel	30895	cyantraniliprole	28	3 days	12 hours	4	—
GF-120 Fruit Fly Bait	28336	spinosad	5	0 days	when dry	10	✓
Imidan WP	29064	phosmet	1B	7 days	72 hours	4	—
Intrepid	27786	methoxyfenozide	18	7 days	12 hours	2	—
Isomate-PTB Dual	30042	pheromone, peachtree borer, lesser peachtree borer	NC	—	—	—	✓
Movento 240 SC	28953	spirotetramat	23	7 days	12 hours	max. 1.12 L/ha	—
Nexter	25135	pyridaben	21	7 days	24 hours	1	—

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Plant extract. U = Mode of action has not been determined.

— = Information is not specified on the product label. ✓ = Potentially organic. Check with certifying body.

¹ General re-entry. ² Hand thinning. ³ Maximum 6 applications per season with no more than 2 dormant applications. ⁴ Maximum 3 applications for cherry leaf spot or 5 applications for all other uses. ⁵ Pruning. ⁶ Depends on rate. See label. ⁷ Hand harvest. ⁸ Preharvest interval is 0 days for mechanical harvest or 1 day for hand harvest. ⁹ Maximum 10 applications per season with no more than 2 dormant applications.

Table 5–3. Products Used on Tart Cherries (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
Products used for insect and mite control or suppression							
Purespray Green Spray Oil 13 E	27666	mineral oil	NC	prebloom	12 hours	2 (dormant)	✓
Rimon 10 EC	28881 28515	novaluron	15	14 days	12 hours	3	—
Silencer 120 EC	29052	lambda-cyhalothrin	3	7 days	24 hours	3	—
Success 480 SC	26835	spinosad	5	3 days	when dry	3	—
Superior 70 Oil	9542	mineral oil	NC	prebloom	12 hours	—	✓
TwinGuard	31442	sulfoxaflor + spinetoram	4C+5	7 days	12 hours	2	—
Vegol Crop Oil	32408	canola oil	NC	0 days	12 hours	2/4 ³	✓
Products used for disease control or suppression							
Bravo ZN	28900	chlorothalonil	M	40 days/Shuck split	48 hours	3	—
Bumper 432 EC	28017	propiconazole	3	3 days	12 hours	3/5 ⁴	—
Cabrio EG	27323	pyraclostrobin	11	10 days	12 hours ¹ /9 days ^{2,5}	5	—
Cantus WDG	30141	boscalid	7	0 days	12 hours	5	—
Copper Spray	19146	copper oxychloride	M	2 days	48 hours	2	✓
Cueva	31825	copper octanoate	M	1 day	4 hours	15	—
Echo 90 DF	29356	chlorothalonil	M	40 days/Shuck split	48 hours	3	—
Elevate 50 WDG	25900	fenhexamid	17	1 day	4 hours	4	—
Equal 65 WP	15608	dodine	U12	7 days	48 hours	2 ⁶	—
Ferbam 76 WDG	20136	ferbam	M	4 days	12 hours	—	—
Fitness	32639	propiconazole	3	3 days	72 hours	3/5 ⁴	—
Flint	30619	trifloxystrobin	11	1 day	12 hours ¹ /4 days ²	5	—
Fontelis	30331	penthiopyrad	7	0 days	12 hours	max. 4.5 L/ha	—
Fracture	32139	BLAD polypeptide	M	0 days	12 hours	3	—
Funginex DC	27686	triforine	3	prebloom	48 hours	3	—
Guardsman Copper Oxychloride 50	13245	copper oxychloride	M	2 days	48 hours	2	✓
Indar	27294	fenbuconazole	3	1 day	12 hours	7	—
Jade	24030	propiconazole	3	3 days	72 hours	3/5 ⁴	—

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Plant extract. U = Mode of action has not been determined.

— = Information is not specified on the product label. ✓ = Potentially organic. Check with certifying body.

¹ General re-entry. ² Hand thinning. ³ Maximum 6 applications per season with no more than 2 dormant applications. ⁴ Maximum 3 applications for cherry leaf spot or 5 applications for all other uses. ⁵ Pruning. ⁶ Depends on rate. See label. ⁷ Hand harvest. ⁸ Preharvest interval is 0 days for mechanical harvest or 1 day for hand harvest. ⁹ Maximum 10 applications per season with no more than 2 dormant applications.

Table 5–3. Products Used on Tart Cherries (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
Products used for disease control or suppression							
Kenja 400 SC	31758	isofetamid	7	1 day	12 hours	3	—
Kumulus DF	18836	sulphur	M	1 day	24 hours	8	✓
Maestro 80 DF	26408	captan	M	5 days	48 hours	—	—
Microthiol Disperss	29487	sulphur	M	1 day	24 hours	8	✓
Nova	22399	myclobutanil	3	1 day	12 hours ¹ /5 days ⁷ / 12 days ²	6	—
Pristine WG	27985	boscalid + pyraclostrobin	7+11	0 days/1 day ⁸	when dry ¹ /24 hours ⁷ / 10 days ²	5	—
Purespray Green Spray Oil 13 E	27666	mineral oil	NC	prebloom	12 hours	2/8 ⁹	✓
Quash	30402	metconazole	3	14 days	12 hours ¹ /9 days ²	1	—
Quintec	29755	quinoxifen	13	7 days	12 hours	5	—
Rovral WP	15213	iprodione	2	1 day	12 hours	—	—
Regalia Maxx	30199	extract of <i>Reynoutria sachalinensis</i>	P5	0 days	when dry	—	✓
Senator 50 SC	32096	thiophanate-methyl	1	1 day	12 hours	max. 4.9 L/ha	—
Sercadis	31697	fluxapyroxad	7	0 days	12 hours	3	—
Serenade OPTI	31666	<i>Bacillus subtilis</i>	44	0 days	when dry	—	✓
Supra Captan 80 WDG	24613	captan	M	5 days	48 hours	—	—
Syllit 400 FL	28351	dodine	U12	7 days	48 hours	4	—
Tilt 250 E	19346	propiconazole	3	3 days	72 hours	3/5 ⁴	—
Vegol Crop Oil	32408	canola oil	NC	0 days	12 hours	2/4 ³	✓
Vivando SC	29765	metrafenone	U8	7 days	12 hours	2	—
Thinners and plant growth regulators							
Apogee	28042	prohexadione calcium	NC	20 days	12 hours	2	—
Ethrel	11580	ethephon	NC	—	48 hours	—	—
Falgro Tablet	27653	gibberellic acid	NC	21 days	12 hours	—	—
ProGibb 40 SG	29359	gibberellin A ₃	NC	21 days	12 hours	—	—

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Plant extract. U = Mode of action has not been determined.

— = Information is not specified on the product label. ✓ = Potentially organic. Check with certifying body.

¹ General re-entry. ² Hand thinning. ³ Maximum 6 applications per season with no more than 2 dormant applications. ⁴ Maximum 3 applications for cherry leaf spot or 5 applications for all other uses. ⁵ Pruning. ⁶ Depends on rate. See label. ⁷ Hand harvest. ⁸ Preharvest interval is 0 days for mechanical harvest or 1 day for hand harvest. ⁹ Maximum 10 applications per season with no more than 2 dormant applications.

PEACH AND NECTARINE CALENDAR

In this section:

- Read the product label and follow all safety precautions. 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>.
- All products labelled for use on peach can also be used on nectarine except Imidan WP, Guardsman Copper Oxychloride, Ferbam 76 WDG, Funginex DC, Granuflo T, Kumulus, Microscopic Sulphur.
- Consult the product label for suggested water volumes. Otherwise, use enough water to ensure thorough spray coverage. Where the product rate is listed in amount per 1,000 L and if a water volume is not provided on the label, use enough water to wet the foliage to the near drip point.
- For preharvest interval, restricted entry interval and maximum number of applications, see Table 5–4. *Products Used on Peaches and Nectarines*, page 303.
- **Products are listed by chemical group and in alphabetical order within each group. The order does not reflect efficacy.** See Table 5–7. *Activity of Fungicides on Tender Fruit Diseases and Impact on Honeybees*, page 340 and Table 5–8. *Activity of Insecticides and Miticides on Tender Fruit Pests and Impact on Honeybees*, page 343, for efficacy ratings.
- Where a product in the calendar is followed by a “*”, it is potentially acceptable for organic use based on *Ministère de l’Agriculture, des Pêcheries et de l’Alimentation du Québec publication Bulletin D’Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with your certifying body to verify the acceptability of any product prior to using it.

Resistance Management

To delay development of resistance to insecticides, miticides and fungicides, follow resistance management guidelines outlined in *Resistance Management Strategies*, page 393. The chemical group is indicated in the “Group” column before the “Product” column. Products belonging to the same chemical group are grouped together in the calendar. Multi-site (M) fungicides are not prone to resistance and do not have to be rotated. Some products are not classified to mode of action (NC) and the mode of action has not been determined for others (U or UN). Group 44 and 46 fungicides are not known to be prone to resistance.

Fungicide resistance management

Take the following steps to avoid rapid development of fungicide resistance:

- Do not reduce rates below those specified on the label.
- Do not use products containing the same chemical group in consecutive applications.
- Do not use Senator, Rovral, Bumper, Jade, Tilt, Fitness, Funginex, Indar, Nova, Quash, Fontelis, Cantus, Kenja, Sercadis, Elevate, Flint or Pristine when sporulating lesions of the target disease are present.
- Do not exceed maximum number of applications on the label.

Insecticide resistance management

Take the following steps to avoid development of insecticide resistance:

- For pests with discrete generations (oriental fruit moth, plum curculio), do not use insecticides from the same group for more than one generation. Within a generation, if more than one spray is required, use a product from the same chemical group.
- For pests with overlapping generations (aphids, mites), do not use products containing the same chemical group in consecutive applications.

Bee Toxicity

Some insecticides are toxic to bees and other pollinating insects. Use of insecticides on flowering crops requires careful management to avoid negative effects on pollinators. Some insecticides cannot be applied prior to or during bloom. Insecticides should not be applied when tree fruit are in bloom. Do not apply insecticides when bees are active. Before and after bloom, bees may be present on flowering cover crops and weeds—do not allow drift of insecticides onto these or other flowering crops. Always follow label precautions to avoid impacts on bees. For more information, see *Bee Poisoning*, page 5, and honeybee toxicity ratings in Table 5–7. *Activity of Fungicides on Tender Fruit Diseases and Impact on Honeybees*, page 340, and Table 5–8. *Activity of Insecticides and Miticides on Tender Fruit Pests and Impact on Honeybees*, page 343.

Buffer Zones

Leave a suitable buffer zone between treatment area and adjacent sensitive areas, such as hedgerows, woodlots and freshwater habitats. Zones may vary depending on the product used, growth stage of the crop and method of application including the use of drift-reducing technology. Check the pesticide label for requirements.

Use Health Canada's online spray drift calculator to modify the buffer zone specified on the label based on weather conditions, category of spray equipment and 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. Unfortunately, this model does not account for carrier volume, travel speed or crop stage.

Observing buffer zones is a legal requirement. A record of the buffer zone modification, if any, must be retained for at least one year from the time of application.

Crop Nutrition

Crop nutrition is important for plant growth, fruit quality development and the acquisition of adequate cold hardiness by tree fruit. For fruit crops, soil testing, plant tissue analysis and visual deficiency symptoms all play an important role in assessing and monitoring the crop's nutritional status. For more information, visit http://www.omafra.gov.on.ca/english/crops/hort/tender_fruit.html (click on *Soil Management, Fertilizer Use, Crop Nutrition and Cover Crops for Fruit Production*) and see OMAFRA Publication 611, *Soil Fertility Handbook*. For soil testing and plant tissue analysis services, see Appendix E: *Accredited Soil-Testing Laboratories in Ontario*, page 435.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Dormant (in March or early April before buds swell)						
Leaf curl	General Comments: • A delay in application may result in poor control of leaf curl. • Apply in a high-volume spray to ensure thorough coverage.					
	M	Bravo ZN or Echo 90 DF	7 L/ha 2.8–5.0 kg/ha	48 hours	60 days/ shuck split	Peaches only. Do not apply within 10 days of Purespray Green Spray Oil because it will burn flower and leaf tissue.
		Copper Spray * or Guardsman Copper Oxychloride 50 *	2 kg/1,000 L water	48 hours	2 days	Peaches only (Guardsman Copper Oxychloride).
		Copper 53W *	1.9 kg/1,000 L water	48 hours	2 days	Peaches only.
		Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	No product specific comments.
		Ferbam 76 WDG	3.5 kg/1,000 L water	12 hours	21 days	Peaches only. If mixing with oil, follow mixing directions on oil label carefully or poor leaf curl control will result.
	U12	Syllit 400 FL	1.8–3.5 L/ 1,000 L water	48 hours	7 days	No product specific comments.
Bacterial spot	M	Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	Apply in a high-volume spray to ensure thorough coverage.
San Jose scale	General Comments: • Apply routinely every third year. If scale is a serious or continuing problem, apply for at least 2 consecutive years. • Apply in a high-volume spray to ensure thorough coverage • Tolerance has not been determined for all varieties. Test a small area of each variety prior to spraying the whole block. • Do not use within 14 days of Supra Captan or Maestro. • Do not apply within 48 hours of freezing temperatures, when temperatures are high (over 30°C), prior to rain or to heat- or moisture- stressed trees.					
	NC	Purespray Green Spray Oil 13 E *	20 L/1,000 L water	12 hours	—	Do not use within 14 days of Ambush, Perm-Up, Pounce, Bravo, Echo or sulphur.
		Superior 70 Oil *	20 L/1,000 L water	12 hours	prebloom	Do not use within 30 days of sulphur.
		Vegol Crop Oil *	20 L/1,000 L water	12 hours	0 days	Do not use within 30 days of sulphur. Do not apply to wet foliage.

¹ General re-entry. ² Harvest. ³ Hand thinning. ⁴ Pick your own harvest. † Personal protective equipment required for some activities. See label.

— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Prebloom (half-inch green to first pink)						
European red mite	General Comments: - This is the preferred timing for red mite control if overwintering populations are high. Red mite populations are more likely to be high if pyrethroid sprays were used the previous year for oriental fruit moth and tarnished plant bug. - Apply in a high-volume spray to ensure thorough coverage - Tolerance has not been determined for all varieties. Test a small area of each variety prior to spraying the whole block. - Do not use within 14 days of Supra Captan or Maestro. - Do not use within 48 hours of freezing temperatures, when temperatures are high (over 30°C), prior to rain or to heat- or moisture- stressed trees.					
	NC	Purespray Green Spray Oil 13 E *	20 L/1,000 L water	12 hours	—	Do not use within 14 days of Ambush, Perm-Up, Pounce, Bravo, Echo or sulphur.
		Superior 70 Oil *	20 L/1,000 L water	12 hours	prebloom	Do not use within 30 days of sulphur.
		Vegol Crop Oil *	20 L/1,000 L water	12 hours	0 days	Do not use within 30 days of sulphur. Do not apply to wet foliage.
Oriental fruit moth	NC	Isomate OFM TT *	125–250 dispensers/ha	—	—	Reduces mating of oriental fruit moth. Apply dispensers before flight begins. Place dispensers in lateral branches in the upper canopy in a uniform manner across the orchard block. Use high rate for high pest pressure areas or during initial year of treatment. Dispensers are designed to last for the entire season. For information on mating disruption, see OMAFRA Factsheet 03–079, <i>Mating Disruption for Management of Insect Pests</i> . If desired, use both an insecticide and mating disruption for managing first-generation oriental fruit moth (see Shuck split).
Pink						
Brown rot (blossom blight stage)	General Comments: - Knock off fruit mummies when pruning. - Group 1, 2, 3, 7, 11 and 17 fungicides are locally systemic and will penetrate petals to protect fruit from infection as blossoms start to open. Consult labels for information on drying time required before rain.					
	M	Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	Do not mix with lime. May cause some defoliation. During excessive moisture and cold, leaf spots can appear on copper-sensitive crops. If concerned about tree sensitivity, test first on a small area.
		Fracture	1.5–3.3 L/ha	12 hours	0 days	Under high disease pressure, use high rate. Do not mix with foliar fertilizers.
		Granuflo-T	1.5–2.25 kg/1,000 L water	24 hours	7 days	Peaches only. For blossom blight, apply at intervals of 3–4 days during bloom.
	1	Senator 50 SC	700 mL/1,000 L water	12 hours	1 day	No product specific comments.
	2	Rovral WP	1.5 kg/ha	12 hours	1 day	No product specific comments.

¹ General re-entry. ² Harvest. ³ Hand thinning. ⁴ Pick your own harvest. † Personal protective equipment required for some activities. See label.

— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Pink						
Brown rot (blossom blight stage) (cont'd)	3	Bumper 432 EC or Fitness or Jade or Tilt 250 E	300 mL/ha 300 mL/ha 500 mL/ha 500 mL/ha	12 hours 72 hours 72 hours 72 hours	3 days	No product specific comments.
		Funginex DC	2.5 L/ha	48 hours	prebloom	Peaches only.
		Indar	140 g/ha	12 hours	1 day	No product specific comments.
		Nova	340 g/ha	12 hours ¹ /5 days ² / 12 days ³	1 day	No product specific comments.
		Quash	175–245 g/ha	12 hours ¹ /9 days ³	14 days	Under high disease pressure, use high rate.
		7	Cantus WDG	370 g/ha	12 hours	0 days
	Fontelis		1.0–1.75 L/ha	12 hours	0 days	Contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
	Kenja 400 SC		913 mL/ha	12 hours	1 day	No product specific comments.
	Sercadis		333 mL/ha	12 hours	0 days	Use a non-ionic surfactant at a rate of 0.125% v/v (1.25 L in 1,000 L water). See Table 5–9. <i>Adjuvants Used in Ontario</i> , page 346.
	7+11	Pristine WG	750 g/ha	when dry ¹ / 24 hours ² /10 days ³	1 day	No product specific comments.
	17	Elevate 50 WDG	1.7 kg/ha	4 hours	1 day	No product specific comments.
	44	Serenade OPTI *	1.1–1.7 kg/ha	when dry	0 days	Suppression only.
	P5	Regalia Maxx *	0.125–0.25% v/v in 500– 1,000 L water/ha	when dry	0 days	Suppression only. Apply before symptoms develop. Use 0.125% (1.25 L in 1,000 L water) in a tank-mix with other brown rot fungicides or 0.25% (2.5 L in 1,000 L water) in rotation with brown rot fungicides.
	Bloom					
DO NOT APPLY INSECTICIDES WHILE PEACH TREES ARE IN BLOOM. SEE BEE POISONING, PAGE 5.						
Brown rot (blossom blight stage)	Use one of the fungicides listed for Brown rot at Pink . Spray when first blossoms are opening. Reapply every 4–5 days if weather is wet. Do not use Funginex after Bloom . Do not use Sercadis after Petal fall .					
Petal fall to Shuck						
Brown rot	Use one of the fungicides listed for Brown rot at Pink . Rotate among fungicide groups for resistance management. Reapply every 4–5 days if weather is wet. Do not use Funginex after Bloom . Do not use Sercadis after Petal fall .					
¹ General re-entry. ² Harvest. ³ Hand thinning. ⁴ Pick your own harvest. † Personal protective equipment required for some activities. See label. — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.						

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Petal fall to Shuck						
Aphids	General Comments: • Apply when 30% of terminals are infested (20 colonies per tree) for peaches and 10% of terminals are infested (5–10 colonies per tree) for nectarines. • Some of these products are toxic to bees. Do not apply when bees are active or hives are in the orchard. Refer to label for specific bee toxicity statements.					
	4A	Admire 240 Flowable or Alias 240 SC	230 mL/ha 230 mL/ha	24 hours	7 days	No product specific comments.
		Clutch 50 WDG	140–210 g/ha	12 hours	7 days	Under high insect pressure, use high rate and shorten interval between applications.
	4C	Closer	100–200 mL/ha	12 hours	7 days	Where possible, rotate with products outside of Group 4.
	4C+5	TwinGuard	250 g/ha	12 hours	7 days	Where possible, rotate with products outside of Group 4.
	23	Movento 240 SC	365 mL/ha	12 hours	7 days	Most effective on young stages of aphids. Control may not be apparent for 2–3 weeks. Under high pressure, a second application may be necessary 2 weeks later. Tank-mix with an adjuvant/additive having spreading and penetrating properties at a suggested rate of 0.2% v/v (2 L/1,000 L). See label and Table 5–9. <i>Adjuvants Used in Ontario</i> , page 346, for further details. Do not tank-mix with sulphur.
	28	Exirel	0.75–1.5 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
	29	Beleaf 50 SG	120–160 g/ha	12 hours ¹ /48 hours ³	14 days	Use high rate for high insect pressure and/or dense foliage.
	NC	Purespray Green Spray Oil 13E *	10 L/1,000 L water	12 hours	—	Suppression only. Begin applications 2 weeks after full bloom. Tolerance has not been determined for all varieties. Test a small area of each variety prior to spraying the whole block. Apply in a high-volume spray to ensure thorough coverage. Do not use within 48 hours of freezing temperatures, when temperatures are high (over 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of Supra Captan, Maestro, Ambush, Perm-Up, Pounce, Bravo, Echo or sulphur.
		Vegol Crop Oil *	2% v/v	12 hours	0 days	Begin applications 2 weeks after full bloom. Apply in a high-volume spray to ensure thorough coverage at a rate of 2% v/v (20 L/1,000 L water). Tolerance has not been determined for all varieties. Test a small area of each variety prior to spraying the whole block. Do not use within 48 hours of freezing temperatures, when temperatures are high (over 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of Supra Captan, Maestro or copper and 30 days of sulphur. Do not apply to wet foliage.

¹ General re-entry. ² Harvest. ³ Hand thinning. ⁴ Pick your own harvest. † Personal protective equipment required for some activities. See label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Petal fall to Shuck						
European red mite	General Comments: If oil was applied in the spring, a miticide is likely not necessary at this time.					
	10	Apollo SC	300 mL/ha	12 hours ¹ / 48 hours ³	21 days	Most effective on eggs and newly hatched nymphs. Apply when leaf tissue is present and before there are 3 active mites per leaf. Use sufficient water volumes to obtain good coverage, but not less than 475 L/ha. Apply within 14 days after petal fall.
	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	Tolerance has not been determined for all varieties. Test a small area of each variety prior to spraying the whole block. See comments on this product for European red mite at Prebloom .
		Vegol Crop Oil *	2% v/v	12 hours	0 days	Tolerance has not been determined for all varieties. Test a small area of each variety prior to spraying the whole block. See comments on this product for European red mite at Prebloom .
Western flower thrips	5	Entrust * or Success	364 mL/ha 182 mL/ha	when dry	14 days	Suppression only. Western flower thrips is a problem primarily in nectarine. Use in a high-volume spray to ensure that spray washes down into the shuck where thrips hide.
Shuck split to Shuck fall						
Oriental fruit moth (first generation)	General Comments: - Where mating disruption products are being used, a pesticide application is generally not required at this time. - Apply within the specified degree-day (DDC, base 7.2°C) after sustained moth catch. Reapply 10–14 days later if catch is extended. For information on calculating degree days, see Appendix B: <i>Degree-Day Modeling</i>, page 428. - Do not use pyrethroids (Group 3) for control of first-generation oriental fruit moth.					
	1	Lorsban 50 W	3.5 kg/ha	4 days	21 days	Apply at 200 DDC. Use for control of first-generation larvae only.
	4A	Assail 70 WP	120–240 g/ha	12 hours ¹ /6 days ³	7 days	Apply at 100–140 DDC. For optimum activity, use high rate in a minimum spray volume of 1,000 L/ha. Do not apply more than once every 12 days.
	15	Rimon 10 EC	1.35–3.35 L/ha	12 hours	14 days	Apply at 111–139 DDC.
	18	Intrepid	1.5 L/ha	12 hours	14 days	Apply at 100–140 DDC. Use for control of first-generation larvae only.
	28	Exirel	500–750 mL/ha	12 hours	3 days	Apply at 194–208 DDC. Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.

¹ General re-entry. ² Harvest. ³ Hand thinning. ⁴ Pick your own harvest. † Personal protective equipment required for some activities. See label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Shuck split to Shuck fall						
Plum curculio	General Comments: - Plum curculio is a sporadic pest of peaches and nectarines. - Scout edges of orchards near woodlots and wild hosts in spring. Check small fruit for crescent-shaped egg-laying scars. Reassess developing fruit for new damage 7–10 days later. - A border spray of 4–6 rows may provide sufficient control.					
	3	Perm-Up EC or Pounce 384 EC	520 mL/ha	when dry	7 days	Under high pressure, may provide suppression only.
	4A	Assail 70 WP	240 g/ha	12 hours ¹ /6 days ³	7 days	Under high pressure, may provide suppression only.
		Clutch 50 WDG	210 g/ha	12 hours	7 days	No product specific comments.
	28	Exirel	1.0–1.5 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
Peachtree borer, Lesser peachtree borer	General Comments: Peachtree borers are sporadic pests. Populations are generally reduced over time where mating disruption is used for several seasons.					
	NC	Isomate-PTB Dual *	375–675 dispensers/ha	—	—	Reduces mating of peachtree and lesser peachtree borer. Apply pheromone dispensers before borer flight begins in the spring, i.e., typically apply at or before Shuck split . Use high rate for high pest pressure areas or during initial year of treatment. Dispensers are designed to last the entire season. For information on mating disruption, see OMAFRA Factsheet 03–079, <i>Mating Disruption for Management of Insect Pests</i> . Insecticides may be needed as long as the maximum labelled rate for the season is not exceeded.
	15	Rimon 10 EC	1.4 L/1,000 L water	12 hours	14 days	Spray in areas with high borer populations. Use pheromone traps to monitor adult activity and begin sprays 1 week after first flight. Reapply at 3-week intervals. Direct these sprays with a handgun to thoroughly cover trunk and scaffold limbs to a height of 1.2 m.
Western flower thrips	Use one of the insecticides listed for Western flower thrips at Petal fall .					
Brown rot	General Comments: - This is a critical period for infection as the fungus can grow from the dying shuck into the susceptible fruit. This results in latent infections that are not expressed until the fruit starts to mature. - Reapply in 7 days if wet weather persists. - Group 2, 3, 7, 11 and 17 fungicides are locally systemic. Consult labels for information on drying time required before rain.					
	M	Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	Do not mix with lime. May cause some defoliation. During excessive moisture and cold, leaf spots can appear on copper-sensitive crops. If concerned about tree sensitivity, test first on a small area.
		Fracture	1.5–3.3 L/ha	12 hours	0 days	Under high disease pressure, use high rate. Do not mix with foliar fertilizers.

¹ General re-entry. ² Harvest. ³ Hand thinning. ⁴ Pick your own harvest. † Personal protective equipment required for some activities. See label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Shuck split to Shuck fall						
Brown rot (cont'd)	M	Granuflo-T	1.5–2.25 kg/ 1,000 L water	24 hours	7 days	Peaches only. For fruit rot, apply at Petal fall and 2 weeks later.
		Maestro 80 DF or Supra Captan 80 WDG	4.5 kg/ha	48 hours	2 days	Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Fontelis or Exirel.
		Microscopic Sulphur WP *	6.3 kg/1,000 L water	24 hours	1 day	Peaches only. May lead to mite outbreaks. Do not use within 14 days of Purespray Green Spray Oil and 30 days of Vegol Crop Oil or Superior Oil.
	2	Rovral WP	1.5 kg/ha	12 hours	1 day	No product specific comments.
	3	Bumper 432 EC or Fitness or Jade or Tilt 250	300 mL/ha 300 mL/ha 500 mL/ha 500 mL/ha	12 hours 72 hours 72 hours 72 hours	3 days	No product specific comments.
		Indar	140 g/ha	12 hours	1 day	No product specific comments.
		Quash	175–280 g/ha	12 hours ¹ /9 days ³	14 days	Under high disease pressure, use high rate.
	7	Cantus WDG	370 g/ha	12 hours	0 days	No product specific comments.
		Fontelis	1.0–1.75 L/ha	12 hours	0 days	Contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
		Kenja 400 SC	913 mL/ha	12 hours	1 day	No product specific comments.
	7+11	Pristine WG	750 g/ha	when dry ¹ / 24 hours ² /10 days ³	1 day	Do not apply where spray drift may reach Concord grapes as it may cause crop injury. Do not tank-mix or make sequential applications with Exirel.
	17	Elevate 50 WDG	1.7 kg/ha	4 hours	1 day	No product specific comments.
Scab	44	Serenade OPTI *	1.1–1.7 kg/ha	when dry	0 days	Suppression only.
	P5	Regalia Maxx *	0.125–0.25% v/v in 500– 1,000 L water/ha	when dry	0 days	Suppression only. Apply before symptoms develop. Use 0.125% (1.25 L in 1,000 L water) in a tank-mix with other brown rot fungicides or 0.25% (2.5 L in 1,000 L water) in rotation with brown rot fungicides.
	General Comments: - Fruit are susceptible to peach scab infections from shuck fall to about 4–6 weeks before harvest. For nectarine, the susceptible period begins earlier (at Shuck split) due to the lack of protective hairy fruit covering. This period marks the greatest scab risk, given the presence of large spore numbers and the increased susceptibility of the developing fruit. - Closely spaced applications with effective fungicides are recommended, particularly for the shuck fall application and during rainy weather. - See Table 5–7. <i>Activity of Fungicides on Tender Fruit Diseases and Impact on Honeybees</i>, page 340, for products that control scab.					
	M	Granuflo-T	1.5–2.25 kg/ 1,000 L water	24 hours	7 days	Peaches only.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Shuck split to Shuck fall						
Scab (cont'd)	M	Kumulus DF * or Microscopic Sulphur WP * or Microthiol Disperss *	22.5 kg/ha 6.5 kg/1,000 L water 22.5 kg/ha	24 hours	1 day	Peaches only (Kumulus and Microscopic Sulphur). Do not use within 14 days of Purespray Green Spray Oil and 30 days of Vegol Crop Oil.
		Maestro 80 DF or Supra Captan 80 WDG	3.75–4.5 kg/ha	48 hours	2 days	Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Fontelis or Exirel.
	3	Quash	175–245 g/ha	12 hours ¹ /9 days ³	14 days	Suppression only.
	7	Fontelis	1.5 L/ha	12 hours	0 days	Contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
Bacterial spot	M	Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	Fruit are susceptible to infection when they are exposed after shucks fall. Do not mix with lime. During excessive moisture and cold, leaf spots can appear on copper-sensitive crops. If concerned about tree sensitivity, test first on a small area.
Powdery mildew	General Comments: Group 3, 7, 11 and U8 fungicides are locally systemic. Consult labels for information on drying time required before rain.					
	3	Quash	280 g/ha	12 hours ¹ /9 days ³	14 days	Suppression only.
	7	Fontelis	1.0–1.75 L/ha	12 hours	0 days	Contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
	11	Flint	140–280 g/ha	12 hours ¹ /7 days ³	1 day	Suppression only. Do not tank-mix or make sequential applications with Exirel.
	NC	Milstop * or Sirocco *	2.8–5.6 kg/ha	4 hours	0 days	Work as eradicants and have little protective activity. Use the lower rate in 500 L of water and the higher rate in 1,000 L of water. Create a mildly alkaline solution. Do not tank-mix with pH adjusters, oil or products not compatible with mild alkaline solutions.
		Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	Suppression only. Tolerance has not been determined for all varieties. Test a small area of each variety prior to spraying the whole block. Apply in a high-volume spray to ensure thorough coverage. Do not use within 48 hours of freezing temperatures, when temperatures are high (over 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of Supra Captan, Maestro, Ambush, Perm-Up, Pounce, Bravo, Echo or sulphur.
		Vegol Crop Oil *	2% v/v	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage at a rate of 2% v/v (20 L/1,000 L water). Tolerance has not been determined for all varieties. Test a small area of each variety prior to spraying the whole block. Do not use within 48 hours of freezing temperatures, when temperatures are high (over 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of Supra Captan, Maestro or copper and 30 days of sulphur. Do not apply to wet foliage.

¹ General re-entry. ² Harvest. ³ Hand thinning. ⁴ Pick your own harvest. † Personal protective equipment required for some activities. See label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Shuck split to Shuck fall						
Powdery mildew (cont'd)	P5	Regalia Maxx *	0.125–0.25% v/v in 500–1,000 L water/ha	when dry	0 days	Suppression only. Apply before symptoms develop. Use 0.125% (1.25 L in 1,000 L water) in a tank-mix with other powdery mildew fungicides or 0.25% (2.5 L in 1,000 L water) in rotation with powdery mildew fungicides.
	U8	Vivando SC	0.75–1.12 L/ha	12 hours	7 days	No product specific comments.
Special sprays (when monitoring indicates the need during early green fruit stage to pit hardening)						
Tarnished plant bug	General Comments: - General timing is mid-June if 2% or more fruit damage is observed. Where plant bug pressure is high and significant new damage is detected, repeat spray in 5–7 days. - Plant bug pressure is lower in orchards with managed sod. Other cultural techniques can reduce damage from this pest.					
	3	Ambush 500 EC or Pounce 384 EC	400 mL/ha 520 mL/ha	when dry	7 days	No product specific comments.
		Mako or Up-Cyde 2.5 EC	175 mL/ha 280 mL/ha	12 hours	7 days	Use in 550 L water/ha. Also controls oak bug.
		Matador 120 EC or Silencer 120 EC	104 mL/ha	24 hours	7 days	No product specific comments.
Second-generation oriental fruit moth (OFM) spray						
Oriental fruit moth (second generation)	General Comments: - If mating disruption is being used, a pesticide application is not required for second-generation larvae. - Spray all varieties. This generation may require 2 insecticide sprays. - Apply insecticides within the specified degree-day (DDC, base 7.2°C) after sustained first-generation moth catch. For information on calculating degree days, see Appendix B: <i>Degree-Day Modeling</i>, page 428. Reapply 10–14 days later if catch is extended. - Check the harvest dates of early varieties and do not spray within the preharvest interval. - Spotted wing drosophila (SWD) is attracted to fruit as soon as they turn from green to yellow. Use a product for oriental fruit moth that is also active against SWD if present in the area. See Table 5–8. <i>Activity of Insecticides and Miticides on Tender Fruit Pests and Impact on Honeybees</i>, page 343.					
	3	Ambush 500 EC or Perm-Up EC or Pounce 384 EC	200–400 mL/ha 275 mL/ha 275 mL/ha	when dry	7 days	Apply at 639–667 and again at 805–833 DDC. Apply Mako and Up-Cyde in 550 L water/ha.
		Decis 5 EC	200 mL/ha	12 hours	1 day	
		Mako or Up-Cyde 2.5 EC	175 mL/ha 280 mL/ha	12 hours	7 days	
		Matador 120 EC or Silencer 120 EC	104 mL/ha	24 hours	7 days	
	4A	Assail 70 WP	120–240 g/ha	12 hours ¹ /6 days ³	7 days	Apply at 583–611 DDC and again at 750–778 DDC. For optimum activity, use high rate in a minimum spray volume of 1,000 L/ha. Do not apply more than once every 12 days.
	5	Delegate	420 g/ha	12 hours	1 day	Apply at 639–667 DDC and again at 805–833 DDC.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Second-generation oriental fruit moth (OFM) spray						
Oriental fruit moth (second generation) (cont'd)	15	Rimon 10 EC	1.35–3.35 L/ha	12 hours	14 days	Apply at 555–583 DDC and again at 722–750 DDC.
	28	Altacor	285 g/ha	12 hours	1 day	Apply at 639–667 DDC and again at 805–833 DDC. Do not tank-mix or make sequential applications of Exirel with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
		Exirel	500–750 mL/ha	12 hours	3 days	
Brown rot (early varieties only – Harrow Diamond through Sunhaven)	Use one of the fungicides listed for brown rot at Shuck split to Shuck fall . Check product labels and Table 5–4. <i>Products Used on Peaches and Nectarines</i> , page 303, for preharvest intervals. Maximum 2 applications of Bumper, Jade, Fitness or Tilt in the 3 weeks prior to harvest.					
Powdery mildew	Use one of the fungicides listed for Powdery mildew at Shuck split to Shuck fall .					
Scab	Use one of the fungicides listed for Scab at Shuck split to Shuck fall .					
Bacterial spot	M	Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	Do not mix with lime. During excessive moisture and cold, leaf spots can appear on copper-sensitive crops. If concerned about tree sensitivity, test first on a small area.
Special sprays (when monitoring indicates the need)						
European red mite, Two-spotted spider mite	General Comments: • Check product labels and Table 5–4. <i>Products Used on Peaches and Nectarines</i>, page 303, for preharvest intervals. • Apply this spray around the second oriental fruit moth spray (early July) if needed. On cultivars Harbrite and later, examine for mites again 3 weeks before harvest. • Spray if 5–10 active pest mites per leaf are present in July and few beneficial mites are present. Monitor carefully because populations of pest mites can build rapidly. • Miticides are best used alone. Use a minimum water volume of 1,000 L/ha for effective control.					
	21	Nexter	300 g/ha	24 hours	14 days	Most effective when applied to nymphs. Use 600 g/ha for two-spotted spider mites.
	23	Envidor 240 SC	750 mL/ha	12 hours	7 days	Control may not be apparent for 2–3 weeks. Apply before mite populations build up.
	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	See comments on this product for European red mite at Prebloom .
		Vegol Crop Oil *	2% v/v	12 hours	0 days	See comments on this product for European red mite at Prebloom .
Japanese beetle	1	Imidan WP	2.68 kg/ha	7 days ^{1†} /14 days ⁴ /30 days ³	14 days	Peaches only.
	28	Altacor	285 g/ha	12 hours	1 day	Suppression only.
		Exirel	1.0–1.5 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Special sprays (when monitoring indicates the need)						
Brown marmorated stink bug	General Comments: - Breeding populations of this pest are present in Ontario. Check ontario.ca/stinkbug for updates on pest development, registered products and management strategies. - There are currently no thresholds established. Apply when insects are first detected or early damage found.					
	4A	Clutch 50 WDG	210–420 g/ha	12 hours	7 days	Suppression only. This product is toxic to beneficial insects and should be used only when necessary.
Spotted wing drosophila	General Comments: - Spotted wing drosophila insert eggs into ripening fruit. Larvae develop in the fruit and may be present at harvest, contributing to premature breakdown. - Weekly insecticides are recommended when fruit is ripening or ripe, and flies are present. - Frequent picking, burial of grade-out fruit, and general sanitation are very important to prevent problems. - Applications should be based on the presence of adult pests (flies) as determined by local monitoring. - These products rely on contact in order to control spotted wing drosophila adults. Apply in a high-volume spray to ensure thorough coverage of fruit,					
	5	Delegate	420 mL/ha	12 hours	1 day	No product specific comments.
	28	Exirel	1.0–1.5 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
San Jose scale	4C+5	TwinGuard	500 g/ha	12 hours	7 days	Apply when crawlers are active in orchards with a history of scale. Reapply, if necessary, after 14 days
Third-generation oriental fruit moth (OFM) spray (late varieties)						
Check preharvest interval before spraying early maturing peaches. See Table 5–4. <i>Products Used on Peaches and Nectarines</i> , page 303.						
Oriental fruit moth	General Comments: - If mating disruption is being used, a pesticide application is not required for third-generation oriental fruit moth. - This spray is usually required for all varieties from Vivid season and later. Check product labels and Table 5–4. <i>Products Used on Peaches and Nectarines</i>, page 303 for preharvest intervals. - Apply within the specified degree-day (DDC, base 7.2°C) after sustained moth catch. For information on calculating degree days, see Appendix B: <i>Degree-Day Modeling</i>, page 428. - Spotted wing drosophila (SWD) are attracted to fruit as soon as they turn from green to yellow. Use a product for oriental fruit moth that is also active against SWD if present in the area. See Table 5–8. <i>Activity of Insecticides and Miticides on Tender Fruit Pests and Impact on Honeybees</i>, page 343.					
	3	Ambush 500 EC or Perm-Up EC or Pounce 384 EC	200–400 mL/ha 275 mL/ha 275 mL/ha	when dry	7 days	Apply at 1,167–1,222 DDC and again at 1,361–1,389 DDC. Apply Mako or Up-Cyde in 550 L water/ha.
		Decis 5 EC	200 mL/ha	12 hours	1 day	
		Mako or Up-Cyde 2.5 EC	175 mL/ha 280 mL/ha	12 hours	7 days	
		Silencer 120 EC	104 mL/ha	24 hours	7 days	

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Third-generation oriental fruit moth (OFM) spray (late varieties)						
Check preharvest interval before spraying early maturing peaches. See Table 5–4. <i>Products Used on Peaches and Nectarines</i> , page 303.						
Oriental fruit moth (cont'd)	4A	Assail 70 WP	120–240 g/ha	12 hours ¹ /6 days ³	7 days	Apply at 1,111–1,167 DDC and again at 1,305–1,389 DDC. For optimum activity, use high rate in a minimum spray volume of 1,000 L/ha. Do not apply more than once every 12 days.
	5	Delegate	420 g/ha	12 hours	1 day	Apply at 1,167–1,222 DDC and again at 1,361–1,389 DDC.
	15	Rimon 10 EC	1.35–3.35 L/ha	12 hours	14 days	Apply at 1,083–1,139 DDC and again at 1,277–1,305 DDC.
	28	Altacor	285 g/ha	12 hours	1 day	Apply at 1,167–1,222 DDC and again at 1,361–1,389 DDC. Do not tank-mix or make sequential applications of Exirel with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
		Exirel	500–750 mL/ha	12 hours	3 days	
Brown rot	Use one of the fungicides listed for Brown rot at Shuck split to Shuck fall . Check product labels and Table 5–4. <i>Products Used on Peaches and Nectarines</i> , page 303, for preharvest intervals. Maximum 2 applications of Bumper, Jade, Fitness or Tilt in the 3 weeks prior to harvest.					
Prepick spray						
Check preharvest interval before spraying early maturing peaches. See Table 5–4. <i>Products Used on Peaches and Nectarines</i> , page 303.						
Oriental fruit moth	Use one of the insecticides listed for Oriental fruit moth at Third-generation oriental fruit moth (OFM) spray . Spray each variety when first colour shows, 7–14 days before first harvest. If mating disruption is being used, a prepick spray is not necessary unless local populations have historically been high or in cases where late-season peaches are the only remaining fruit in an area.					
Brown rot	Use one of the fungicides listed for Brown rot at Shuck split to Shuck fall . Check product labels and Table 5–4. <i>Products Used on Peaches and Nectarines</i> , page 303, for preharvest intervals. Maximum 2 applications of Bumper, Jade, Fitness or Tilt in the 3 weeks prior to harvest.					
Postharvest fruit treatment						
Blue mould, Grey mould, Brown rot, Rhizopus rot	12	Scholar 230 SC	496 mL/378 L water	—	post-harvest	Postharvest treatment may be necessary during wet harvest seasons. These treatments will prolong storage time while providing control of postharvest diseases. See label for dip and drench instructions.
Fall spray						
Leaf curl	General Comments:					
	• Apply any time after leaves are off in fall or winter when temperature in shade is above freezing and conditions favour rapid drying.					
	M	Bravo ZN or Echo 90 DF	7 L/ha 2.8–3.9 kg/ha	48 hours	—	No product specific comments.
		Copper Spray * or Guardsman Copper Oxychloride 50 *	2 kg/1,000 L water	48 hours	—	Peaches only (Guardsman).
Cueva		1% v/v in 470–940 L water/ha	4 hours	—	No product specific comments.	

¹ General re-entry. ² Harvest. ³ Hand thinning. ⁴ Pick your own harvest. † Personal protective equipment required for some activities. See label.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

¹ General re-entry. ² Harvest. ³ Hand thinning. ⁴ Pick your own harvest. † Personal protective equipment required for some activities. See label.

— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 5–4. Products Used on Peaches and Nectarines

Use this table as a guide but refer to product label for specific information.

The **preharvest interval** is the number of days between the last spray and first harvest.

The **restricted entry interval** is the minimum interval that must be observed between application of the pesticide and work in the treated crop without protective equipment. If no re-entry period is stated on the label, assume it is 12 hours.

The **maximum applications** is the labelled maximum number or product amount applied for the growing season and may be higher than what is recommended for resistance management or for the preservation of beneficial insects.

Products listed as **potentially organic** may be acceptable for organic use based on *Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec publication Bulletin D'Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with certifying body to verify the acceptability of any product prior to using it.

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
Products used for insect and mite control or suppression							
Admire 240 Flowable	24094	imidacloprid	4A	7 days	24 hours	2	—
Alias 240 SC	28475	imidacloprid	4A	7 days	24 hours	2	—
Altacor	28981	chlorantraniliprole	28	1 day	12 hours	3 (max. 645 g/ha)	—
Ambush 500 EC	14882	permethrin	3	7 days	when dry	—	—
Apollo SC	21035	clofentezine	10	21 days	12 hours ¹ /48 hours ²	1	—
Assail 70 WP	27128	acetamiprid	4A	7 days	12 hours ¹ /6 days ²	4	—
Beleaf 50 SG	29796	flonicamid	29	14 days	12 hours ¹ /48 hours ²	3	—
Closer	30826	sulfoxaflor	4C	7 days	12 hours	2	—
Clutch 50 WDG	29382	clothianidin	4A	7 days	12 hours	2 (max. 420 g/ha)	—
Decis 5 EC	22478	deltamethrin	3	1 day	12 hours	1	—
Delegate	28778	spinetoram	5	1 day	12 hours	3	—
Entrust	30382	spinosad	5	1 day	when dry	3	✓
Envior 240 SC	28051	spirodiclofen	23	7 days	12 hours	1	—
Exirel	30895	cyantraniliprole	28	3 days	12 hours	4	—
Imidan WP	29064	phosmet	1B	14 days	7 days ^{1†} /14 days ³ /30 days ²	4	—
Intrepid	27786	methoxyfenozide	18	14 days	12 hours	1	—
Isomate OFM TT	31419	pheromone, oriental fruit moth	NC	—	—	—	✓
Isomate-PTB Dual	30042	pheromone, peachtree borer, lesser peachtree borer	NC	—	—	—	✓
Lorsban 50 W	20944	chlorpyrifos	1B	21 days	4 days	2	—
Mako	30316	cypermethrin	3	7 days	12 hours	2	—

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Plant extract. UN = Mode of action has not been determined.

— = Information is not specified on the product label. ✓ = Potentially organic. Check with certifying body.

¹ General re-entry. ² Hand thinning. ³ Pick your own harvest. ⁴ Maximum 9 applications per season with no more than 1 dormant application. ⁵ Maximum 5 applications per season with no more than 1 dormant application. ⁶ No more than 2 applications of this group in the 3 weeks prior to harvest. ⁷ Maximum 5 applications per year for peach or 10 applications per year for nectarine.

⁸ Harvest. * Personal protective equipment required for some activities. See label.

Table 5–4. Products Used on Peaches and Nectarines (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
Products used for insect and mite control or suppression							
Matador 120 EC	24984	lambda-cyhalothrin	3	7 days	24 hours	3	—
Movento 240 SC	28953	spirotetramat	23	7 days	12 hours	max. 1.12 L/ha	—
Nexter	25135	pyridaben	21	14 days	24 hours	1	—
Perm-Up EC	28877	permethrin	3	7 days	12 hours	—	—
Pounce 384 EC	16688	permethrin	3	7 days	when dry	—	—
Purespray Green Spray Oil 13 E	27666	mineral oil	NC	—	12 hours	1/8 ⁴	✓
Rimon 10 EC	28881 28515	novaluron	15	14 days	12 hours	3	—
Silencer 120 EC	29052	lambda-cyhalothrin	3	7 days	24 hours	3	—
Success	26835	spinosad	5	14 days	when dry	3	—
Superior 70 Oil	9542 14981	mineral oil	NC	prebloom	12 hours	1 (dormant)	✓
TwinGuard	31442	sulfoxaflor + spinetoram	4C+5	7 days	12 hours	2	—
Up-Cyde 2.5 EC	28795	cypermethrin	3	7 days	12 hours	2	—
Vegol Crop Oil	32408	canola oil	NC	0 days	12 hours	1/4 ⁵	✓
Products used for disease control or suppression							
Bravo ZN	28900	chlorothalonil	M	60 days/Shuck split	48 hours	1 (dormant)	—
Bumper 432 EC	28017	propiconazole	3	3 days	12 hours	5 ⁶	—
Cantus WDG	30141	boscalid	7	0 days	12 hours	5	—
Copper 53 W	9934	tri-basic copper sulphate	M	2 days	48 hours	2	✓
Copper Spray	19146	copper oxychloride	M	2 days	48 hours	2	✓
Cueva	31825	copper octanoate	M	1 day	4 hours	5/10 ⁷	—
Echo 90 DF	29356	chlorothalonil	M	60 days/Shuck split	48 hours	1 (dormant)	—
Ferbam 76 WDG	20136	ferbam	M	21 days	12 hours	—	—
Fitness	32639	propiconazole	3	3 days	72 hours	5 ⁶	—
Flint	30619	trifloxystrobin	11	1 day	12 hours ¹ /7 days ²	4	—
Fontelis	30331	penthiopyrad	7	0 days	12 hours	max. 4.5 L/ha	—
Fracture	32139	BLAD polypeptide	M	0 days	12 hours	3	—

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Plant extract. UN = Mode of action has not been determined.

— = Information is not specified on the product label. ✓ = Potentially organic. Check with certifying body.

¹ General re-entry. ² Hand thinning. ³ Pick your own harvest. ⁴ Maximum 9 applications per season with no more than 1 dormant application. ⁵ Maximum 5 applications per season with no more than 1 dormant application. ⁶ No more than 2 applications of this group in the 3 weeks prior to harvest. ⁷ Maximum 5 applications per year for peach or 10 applications per year for nectarine.

⁸ Harvest. * Personal protective equipment required for some activities. See label.

Table 5–4. Products Used on Peaches and Nectarines (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
Products used for disease control or suppression							
Funginex DC	27686	triforine	3	prebloom	48 hours	3	—
Granuflo-T	30548	thiram	M	7 days	24 hours	7	—
Guardsman Copper Oxychloride 50	13245	copper oxychloride	M	2 days	48 hours	2	✓
Indar	27294	fenbuconazole	3	1 day	12 hours	7	—
Jade	24030	propiconazole	3	3 days	72 hours	5 ⁶	—
Kenja 400 SC	31758	isofetamid	7	1 day	12 hours	3	—
Kumulus DF	18836	sulphur	M	1 day	24 hours	8	✓
Maestro 80 DF	26408	captan	M	2 days	48 hours	—	—
Microscopic Sulphur WP	14653	sulphur	M	1 day	24 hours	8	✓
Microthiol Disperss	29487	sulphur	M	1 day	24 hours	8	✓
Milstop	28095	potassium bicarbonate	UN	0 days	4 hours	10	✓
Nova	22399	myclobutanil	3	1 day	12 hours ¹ /5 days ⁸ / 12 days ²	6	—
Pristine WG	27985	boscalid + pyraclostrobin	7+11	1 day	when dry ¹ /24 hours ⁸ / 10 days ²	5	—
Purespray Green Spray Oil 13 E	27666	mineral oil	NC	—	12 hours	1/8 ⁴	✓
Quash	30402	metconazole	3	14 days	12 hours ¹ /9 days ²	1	—
Regalia Maxx	30199	extract of <i>Reynoutria sachalinensis</i>	P5	0 days	when dry	—	✓
Rovral WP	15213	iprodione	2	1 day	12 hours	—	—
Scholar 230 SC	29528	fludioxonil	12	postharvest	—	1	—
Senator 50 SC	32096	thiophanate-methyl	1	1 day	12 hours	max. 4.9 L/ha	—
Sercadis	31697	fluxapyroxad	7	0 days	12 hours	3	—
Serenade OPTI	31666	<i>Bacillus subtilis</i>	44	0 days	when dry	—	✓
Sirocco	31091	potassium bicarbonate	UN	0 days	4 hours	10	✓
Supra Captan 80 WDG	24613	captan	M	2 days	48 hours	—	—
Syllit 400 FL	28351	dodine	U12	7 days	48 hours	4	—
Tilt 250 E	19346	propiconazole	3	3 days	72 hours	5 ⁶	—
Vegol Crop Oil	32408	canola oil	NC	0 days	12 hours	1/4 ⁵	✓
Vivando SC	29765	metrafenone	U8	7 days	12 hours	2	—

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Plant extract. UN = Mode of action has not been determined.

— = Information is not specified on the product label. ✓ = Potentially organic. Check with certifying body.

¹ General re-entry. ² Hand thinning. ³ Pick your own harvest. ⁴ Maximum 9 applications per season with no more than 1 dormant application. ⁵ Maximum 5 applications per season with no more than 1 dormant application. ⁶ No more than 2 applications of this group in the 3 weeks prior to harvest. ⁷ Maximum 5 applications per year for peach or 10 applications per year for nectarine.

⁸ Harvest. * Personal protective equipment required for some activities. See label.

PEAR CALENDAR

In this section:

- Read the product label and follow all safety precautions. 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>.
- Consult the product label for suggested water volumes. Otherwise, use enough water to ensure thorough spray coverage. Where the product rate is listed in amount per 1,000 L, and if a water volume is not provided on the label, use enough water to wet the foliage to the near drip point.
- For preharvest interval, restricted entry interval and maximum number of applications, see Table 5–5. *Products Used on Pears*, page 323.
- **Products are listed by chemical group and in alphabetical order within each group. The order does not reflect efficacy.** See Table 5–7. *Activity of Fungicides on Tender Fruit Diseases and Impact on Honeybees*, page 340 and Table 5–8. *Activity of Insecticides and Miticides on Tender Fruit Pests and Impact on Honeybees*, page 343, for efficacy ratings.
- Where a product in the calendar is followed by a “*”, it is potentially acceptable for organic use based on *Ministère de l’Agriculture, des Pêcheries et de l’Alimentation du Québec publication Bulletin D’Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with your certifying body to verify the acceptability of any product prior to using it.
- Information on the timing and rates of application for plant growth regulators and chemical thinners can be found in the crop calendars. For additional information on plant growth regulators and thinning, visit http://www.omafra.gov.on.ca/english/crops/hort/tender_fruit.html and click on *Plant Growth Regulators for Fruit Crops* and *Thinning of Tree Fruit*.

Resistance Management

To delay development of resistance to insecticides, miticides and fungicides, follow resistance management guidelines outlined in *Resistance Management Strategies*, page 393. The chemical group is indicated in the “Group” column before the “Product” column. Products belonging to the same chemical group are grouped together in the calendar. Multi-site (M) fungicides are not prone to resistance and do not have to be rotated. Some products are not classified to mode of action (NC) and the mode of action has not been determined for others (U or UN). Group 44 and 46 fungicides are not known to be prone to resistance.

Fungicide resistance management

Take the following steps to avoid rapid development of fungicide resistance:

- Do not reduce rates below those specified on the label.
- Do not use products containing the same chemical group in consecutive applications.
- Do not use Inspire Super, Scala, Aprovia, Fontelis, Sercadis, Flint, Sovran, Pristine or Syllit when sporulating scab lesions are present.
- Do not exceed maximum number of applications on the label.

Insecticide resistance management

Take the following steps to avoid development of insecticide resistance:

- For pests with discrete generations (pear psylla, oriental fruit moth, codling moth, obliquebanded leafroller) do not use insecticides from the same group for more than one generation. Within a generation, if more than one spray is required, use a product from the same chemical group.
- For pests with overlapping generations (mites), do not use products containing the same chemical group in consecutive applications.

Bee Toxicity

Some insecticides are toxic to bees and other pollinating insects. Use of insecticides on flowering crops requires careful management to avoid negative effects on pollinators. Some insecticides cannot be applied prior to or during bloom. Insecticides should not be applied when tree fruit are in bloom. Do not apply insecticides when bees are active. Before and after bloom, bees may be present on flowering cover crops and weeds—do not allow drift of insecticides onto these or other flowering crops. Always follow label precautions to avoid impacts on bees. For more information, see *Bee Poisoning*, page 5, and honeybee toxicity ratings in Table 5–7. *Activity of Fungicides on Tender Fruit Diseases and Impact on Honeybees*, page 340, and Table 5–8. *Activity of Insecticides and Miticides on Tender Fruit Pests and Impact on Honeybees*, page 343.

Buffer Zones

Leave a suitable buffer zone between treatment area and adjacent sensitive areas, such as hedgerows, woodlots and freshwater habitats. Zones may vary depending on the product used, growth stage of the crop and method of application including the use of drift-reducing technology. Check the pesticide label for requirements.

Use Health Canada’s online spray drift calculator to modify the buffer zone specified on the label based on weather conditions, category of spray equipment and 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. Unfortunately, this model does not account for carrier volume, travel speed or crop stage.

Observing buffer zones is a legal requirement. A record of the buffer zone modification, if any, must be retained for at least one year from the time of application.

Crop Nutrition

Crop nutrition is important for plant growth, fruit quality development and the acquisition of adequate cold hardiness by tree fruit. For fruit crops, soil testing, plant tissue analysis and visual deficiency symptoms all play an important role in assessing and monitoring the crop's nutritional status. For more information, visit http://www.omafra.gov.on.ca/english/crops/hort/tender_fruit.html (click on *Soil Management, Fertilizer Use, Crop Nutrition and Cover Crops for Fruit Production*) and see OMAFRA Publication 611, *Soil Fertility Handbook*. For soil testing and plant tissue analysis services, see Appendix E: *Accredited Soil-Testing Laboratories in Ontario*, page 435.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Dormant						
Scale insects, Pear psylla	General Comments: • Apply in a high-volume spray to ensure thorough coverage. • Tolerance has not been determined for all varieties. Test a small area of each variety prior to spraying the whole block. • Do not use within 14 days of Supra Captan or Maestro. • Do not use within 48 hours of freezing temperatures, when temperatures are high (over 30°C), prior to rain or to heat- or moisture-stressed trees.					
	NC	Purespray Green Spray Oil 13 E *	20 L/1,000 L water	12 hours	—	In addition to precautions in general comments, do not use within 14 days of Ambush, Perm-Up, Pounce or sulphur.
		Superior 70 Oil *	20 L/1,000 L water	12 hours	prebloom	In addition to precautions in general comments, do not apply after green-tip. Do not use within 30 days of sulphur.
		Vegol Crop Oil *	20 L/1,000 L water	12 hours	0 days	In addition to precautions in general comments, do not use within 14 days of copper or 30 days of sulphur. Do not apply to wet foliage.
Blister mite	M	Lime Sulphur *	7.3 L /100 L water	48 hours	120 days	Dormant application only. Apply in a high-volume spray to ensure thorough coverage.
Fire blight	M	Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	Copper is a contact fungicide only and does not have activity on the fire blight pathogen within the plant tissue. Apply when overwintering cankers begin to ooze as tree breaks dormancy. Thorough coverage of limbs and trunk is essential for good control. This spray does not eliminate the need for blossom blight management.
Tree growth modification	NC	Promalin SL	100–166 mL/500 mL latex paint	12 hours	28 days	Mix with latex paint and apply directly to buds with a brush or sponge uniformly covering the bark surface. Apply to 1-year-old wood only. Apply when terminal buds have started to swell, but before bud break as this may result in injury to tender side shoot tips. Notching bark above the bud with a hacksaw blade prior to treatment will greatly increase efficacy. Do not use when temperatures are below freezing, above 30°C or if rain is forecast within 6 hours. For additional information, visit http://www.omafra.gov.on.ca/english/crops/hort/tender_fruit.html and click on <i>Plant Growth Regulators for Fruit Crops</i> .

¹ General re-entry. ² Hand thinning. ³ Hand labour and scouting. ⁴ Harvest. ⁵ Pick your own harvest. † Personal protective equipment required for some activities. See label.
 — = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Green tip						
Scab General Comments: - Start scab control early and reapply if weather remains wet. - Group 1, 3, 7, 9 and U12 fungicides are locally systemic. Consult labels for information on drying time required before rain.						
M	Cueva		1% v/v in 470–940 L water/ha	4 hours	1 day	Do not mix with lime. During excessive moisture and cold, leaf spots can appear on copper-sensitive crops. If concerned about tree sensitivity, test first on a small area.
	Maestro 80 DF or Supra Captan 80 WDG		3.75 kg/ha	48 hours	7 days	Do not use on d'Anjou pears. Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Fontelis or Exirel.
1	Senator 50 SC plus 1/2 to full rate Group M		250 mL/1,000 L water See Group M above	12 hours	1 day	Tank mix with a compatible protectant Group M fungicide. See label for suggested tank-mix products.
3+7	Aprovia Top 195 EC		386–643 mL/ha	12 hours	30 days	Maximum 2 sequential applications before rotating to a different fungicide group. Use high rate and shorten interval between applications under high disease pressure.
3+9	Inspire Super		560–836 mL/ha	12 hours	14 days	This product does not provide good control of fruit scab. Use during primary scab period only. Use high rate and shorten interval between applications under high disease pressure.
7	Fontelis		1.0–1.5 L/ha	12 hours	28 days	Reapply as needed on a 7–10-day interval. Use high rate and shorten interval between applications under high disease pressure. Maximum of 2 applications per season. Fontelis contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions. Use Sercadis with a non-ionic surfactant at a rate of 0.125% v/v (1.25 L in 1,000 L water). See Table 5–9. <i>Adjuvants Used in Ontario</i> , page 346.
	Sercadis		333 mL/ha	12 hours	0 days	
7+9	Luna Tranquility		800 mL/ha	12 hours ¹ /24 hours ²	72 days	Shorten interval between applications under high disease pressure.
9	Scala SC		1 L/ha	12 hours ¹ /24 hours ²	72 days	Do not apply postbloom.
44	Serenade OPTI *		1.7–3.3 kg/ha	when dry	0 days	Suppression only. Apply preventatively at 7–10-day intervals. Use in conjunction with other cultural or chemical controls.
NC	Buran *		1.8 % v/v (9 L in 500 L water/ha)	when dry	0 days	Suppression only. Do not use more than 18 L/ha per application. This product should be used only as a post-infection treatment. Reapply 7–14 days when conditions are conducive to disease development. This is a new product in Ontario and little evidence of its efficacy is available. Do not apply if rain is forecast within 48 hours.
U12	Syllit 400 FL plus 1/2 to full rate Group M		5.28 L/ha See Group M above	48 hours	7 days	Tank-mix with a compatible protectant Group M fungicide. See label for suggested tank-mix products.

¹ General re-entry. ² Hand thinning. ³ Hand labour and scouting. ⁴ Harvest. ⁵ Pick your own harvest. † Personal protective equipment required for some activities. See label.

— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Green tip						
European red mite, Pear psylla	General Comments: • Best applied at or near Green tip for mites. Oil does not control rust mites. • Apply in a high-volume spray to ensure thorough coverage. • Tolerance has not been determined for all varieties. Test a small area of each variety prior to spraying the whole block. • Do not use within 14 days of Supra Captan or Maestro. • Do not use within 48 hours of freezing temperatures, when temperatures are high (over 30°C), prior to rain or to heat- or moisture-stressed trees.					
	NC	Purespray Green Spray Oil 13 E *	20 L/1,000 L water	12 hours	—	In addition to precautions in general comments, do not use within 14 days of Ambush, Perm-Up, Pounce or sulphur.
		Superior 70 Oil *	20 L/1,000 L water	12 hours	prebloom	In addition to precautions in general comments, do not apply after Green tip . Do not use within 30 days of sulphur.
		Vegol Crop Oil *	20 L/1,000 L water	12 hours	0 days	In addition to precautions in general comments, do not use within 14 days of copper or 30 days of sulphur. Do not apply to wet foliage.
Pear psylla	3	Ambush 500 EC	400 mL/ha	when dry	7 days	No product specific comments.
	4D	Sivanto Prime	0.75–1.0 L/ha + horticultural oil (0.25% v/v)	12 hours	14 days	If using oil, may cause fruit injury to certain varieties of pears, particularly d'Anjou and other sensitive varieties, when used alone or when other products are applied sequentially. Do not use oil within 14 days of Supra Captan, Maestro, Ambush, Perm-Up, Pounce or sulphur product. Do not apply when temperatures exceed 30°C, to crops under moisture stress or just prior to rain.
	NC	Surround WP *	50 kg/ha	12 hours	0 days	Begin spray program before overwintering adults are active. Make 2 applications at 50 kg/ha, 7 days apart, to establish a base layer. Continue at 7–14-day intervals, using a reduced rate of 25 kg/ha, to maintain even coverage of new growth. Surround may interfere with optimum bee activity. Do not apply from tight cluster to petal fall. Light to moderate rain will help distribute product. Reapply after heavy rain, strong wind or overhead irrigation. Do not use with anti-foaming agents, spreader/stickers or oil.
Oriental fruit moth	NC	Isomate OFM TT *	125–250 dispensers/ha	—	—	Reduces mating for oriental fruit moth. Apply dispensers before flight begins. Place dispensers in lateral branches in the upper canopy in a uniform manner across the orchard block. Use high rate for high-pressure areas or initial year of treatment. Dispensers are designed to last for the entire season. For information on mating disruption, see OMAFRA Factsheet 03–079, <i>Mating Disruption for Management of Insect Pests</i> . If desired, use both an insecticide and mating disruption for managing first-generation larvae (see Petal fall).

¹ General re-entry. ² Hand thinning. ³ Hand labour and scouting. ⁴ Harvest. ⁵ Pick your own harvest. † Personal protective equipment required for some activities. See label.

— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Green tip						
San Jose scale, Oystershell scale	General Comments: • Apply in a high-volume spray to ensure thorough coverage. • Use in orchards with high populations of scale in combination with dormant oil application.					
	4C+5	TwinGuard	250–500 g/ha	12 hours	7 days	Where possible, rotate with products outside of Group 4.
	4D	Sivanto Prime	0.75–1.0 L/ha + horticultural oil (0.25% v/v)	12 hours	14 days	If using oil, may cause fruit injury to certain varieties of pears, particularly d'Anjou and other sensitive varieties, when used alone or when other products are applied sequentially. Do not use oil within 14 days of Supra Captan, Maestro, Ambush, Perm-Up, Pounce or sulphur product. Do not apply when temperatures exceed 30°C, to crops under moisture stress or just prior to rain. Where possible, rotate with products outside of Group 4.
White bud (white petals showing on flowers)						
Scab	Use one of the fungicides listed for Scab at Green tip . Start scab control early and continue at 7–10-day intervals if weather remains wet.					
Pear psylla	General Comments: • To avoid resistance problems, do not use pyrethroids at this stage. Refer to comments at First cover.					
	3	Ambush 500 EC	400 mL/ha	when dry	7 days	No product specific comments.
	4A	Assail 70 WP	120 g/ha	12 hours ¹ / 48 hours ³ /6 days ²	7 days	No product specific comments.
		Calypso 480 SC	290–440 mL/ha	12 hours	30 days	Apply high rate under high pressure. Apply when populations have reached economic thresholds and the majority of the population is in early instar stages. Reapply at 7–10-day intervals if needed.
	4D	Sivanto Prime	0.75–1.0 L/ha + horticultural oil (0.25% v/v)	12 hours	14 days	Suppression only. See comments on this product for Pear psylla at Green tip . Where possible, rotate with products outside of Group 4.
	21	Nexter	600 g/ha	24 hours	25 days	There is little commercial experience with this product for psylla.
Codling moth, Oriental fruit moth	NC	Isomate-CM/OFM TT *	200–500 dispensers/ha	—	—	Reduces mating of codling moth and oriental fruit moth. Apply prior to flight of codling moth, no later than petal fall. Place dispensers in lateral branches in the upper canopy in a uniform manner across the orchard block. Use the high rate for high-pressure areas or initial year of treatment. Dispensers are designed to last for the entire season. For information on mating disruption, see OMAFRA Factsheet 03–079, <i>Mating Disruption for Management of Insect Pests</i> . Most orchards will require insecticides applied for one or both codling moth generations to avoid unacceptable levels of damage.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Bloom There are special pollination requirements for pears. See <i>Pollination Requirements for Fruit Crops</i> at ontario.ca/crops .						
DO NOT APPLY INSECTICIDES WHILE PEARS ARE IN BLOOM. SEE BEE POISONING, PAGE 5.						
Fire blight	General Comments: - Models to time fire blight sprays (e.g., Maryblyt, Cougar Blight) are available. For more information, see ontario.ca/cropipm. Ontario prediction maps are also available at omafra.gov.on.ca/english/crops/facts/fireblight-2pears.htm. - Otherwise, apply sprays if temperatures over 18°C are accompanied by high humidity (over 69%), heavy dews or rainfall. - Products are most effective when applied dilute (high volumes of water) prior to an infection period. Use alone for best results. - Do not use alternate tree-row application method.					
	M	Copper 53 W *	1 kg/ha plus 6 kg lime/1,000 L water	48 hours	2 days	Pre-mix hydrated lime in a pail with enough water to make a slurry. Pour through a 0.3 mm screen into spray tank partly filled with water and with mechanical agitator running. Allow 15 minutes of mixing before spraying. Maintain agitation throughout application. Incompatible with all other insecticides and fungicides.
		Copper Spray *	2.2 kg/1,000 L water	48 hours	2 days	Do not apply on Anjou. In case of hail damage, apply within 24 hours of event.
		Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	Do not mix with lime. During excessive moisture and cold, leaf spots can appear on copper-sensitive crops. If concerned about tree sensitivity, test first on a small area.
	24	Kasumin 2L	5 L in 1,000 L water/ha	12 hours	90 days	Apply at 20–30% bloom or when conditions favour disease development. Do not make more than 2 consecutive applications. Do not apply after Petal fall . If using lower water volumes, refer to water volume chart on label for rate recommendations.
	25	Streptomycin 17	600 g/1,000 L water	24 hours ¹ / 7 days ³ /14 days ²	30 days	Apply at 20–30% bloom or when conditions favour disease development. UV light-sensitive, so is effective for only 2–3 days. If warm, wet conditions (above 20°C) prevail, 2–3 sprays during bloom may be required. For resistance management, rotate with a different fungicide group. Do not use after Copper 53 W.
	44	Double Nickel LC *	5.0–7.5 L/ha	when dry	0 days	Suppression only. Apply at 1–5% bloom and reapply every 3–7 days if conditions favour disease development. Can be mixed with copper fungicides to improve control.
		Serenade OPTI *	1.1–1.7 kg/ha	when dry	0 days	Suppression only. Apply at 1–5% bloom and reapply as needed if conditions favour disease development. Under high pressure, follow with Streptomycin 2–3 days later.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Bloom There are special pollination requirements for pears. See <i>Pollination Requirements for Fruit Crops</i> at ontario.ca/crops .						
DO NOT APPLY INSECTICIDES WHILE PEARS ARE IN BLOOM. SEE BEE POISONING, PAGE 5.						
Fire blight (cont'd)	NC	Blossom Protect *	See comments	when dry	0 days	For every 1 m of tree height, dilute 5.25 kg Component A in 500 L/ha water and add dilution to 0.75 kg Component B. If a forecast system (e.g., Maryblyt, Cougar Blight) is available, apply 1–2 days before an infection date. Repeat after 2 days and up to 5 times if infection continues. If no forecast system is available, apply at 10, 40, 70 and 90% open blossoms. This product is sensitive to fungicides and may have reduced efficacy if tank-mixed or applied within 2 days of certain products. See label for further details. Russetting may occur on sensitive varieties.
Scab	General Comments: Group 3, 7, 9, 11 and U12 fungicides are locally systemic. Consult labels for information on drying time required before rain.					
	M	Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	Do not mix with lime. During excessive moisture and cold, leaf spots can appear on copper-sensitive crops. If concerned about tree sensitivity, test first on a small area.
		Maestro 80 DF or Supra Captan 80 WDG	3.75 kg/ha	48 hours	7 days	Do not use on d'Anjou pears. Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Fontelis or Exirel.
	3	Nova	340 g/ha	12 hours	14 days	Apply in 500–1,000 L/water. For improved fruit scab control, tank-mix with a compatible protectant Group M fungicide.
	3+7	Aprovia Top 195 EC	386–643 mL/ha	12 hours	30 days	For improved fruit scab control, tank-mix with a compatible protectant Group M fungicide.
	3+9	Inspire Super	560–836 mL/ha	12 hours	14 days	For improved fruit scab control, tank-mix with a compatible protectant Group M fungicide.
	7	Fontelis	1.0–1.5 L/ha	12 hours	28 days	Tank-mix with a compatible protectant Group M fungicide. See label for suggested tank-mix products. Fontelis contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
		Sercadis	333 mL/ha	12 hours	0 days	Use Sercadis with a non-ionic surfactant at a rate of 0.125% v/v (1.25 L in 1,000 L water). See Table 5–9. <i>Adjuvants Used in Ontario</i> , page 346.
	7+9	Luna Tranquility	800 mL/ha	12 hours ¹ / 24 hours ²	72 days	No product specific comments.
	7+11	Pristine WG	1.0–1.2 kg/ha	when dry ¹ / 5 days ⁴ /12 days ²	5 days	Do not tank-mix or make sequential applications with Exirel.
	9	Scala SC	1 L/ha	12 hours ¹ / 24 hours ²	72 days	Do not apply postbloom.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Bloom						
There are special pollination requirements for pears. See <i>Pollination Requirements for Fruit Crops</i> at ontario.ca/crops .						
DO NOT APPLY INSECTICIDES WHILE PEARS ARE IN BLOOM. SEE BEE POISONING, PAGE 5.						
Scab (cont'd)	11	Flint	140 g/ha	12 hours ¹ /4 days ²	14 days	Do not tank-mix or make sequential applications with Exirel.
		Sovran	240 g/ha	48 hours	30 days	Where disease pressure is high, use up to 360 g/ha. Do not tank-mix or make sequential applications with Exirel.
	44	Serenade OPTI *	1.7–3.3 kg/ha	when dry	0 days	Suppression only. Apply preventatively at 7–10-day intervals. Use in conjunction with other cultural or chemical controls.
	NC	Buran *	1.8 % v/v (9 L in 500 L water/ha)	when dry	0 days	Suppression only. See comments on this product for Scab at Green tip .
	U12	Syllit 400 FL plus 1/2 to full rate Group M	5.28 L/ha See Group M above	48 hours	7 days	Tank-mix with a compatible protectant Group M fungicide. See label for suggested tank-mix products.
Tree growth modification	NC	Promalin SL	127–526 mL/ 10 L water	12 hours	28 days	Used to stimulate lateral bud break and additional branch growth on young non-bearing trees, providing better tree structure for early cropping. Apply when new terminal growth is 2.5–8 cm long (approximately king bloom to 1 week after petal fall). Thoroughly soak the area of the tree with a hand sprayer where branching is desired. Do not use when temperatures are below freezing or above 32°C. For additional information, visit http://www.omafr.gov.on.ca/english/crops/hort/tender_fruit.html and click on <i>Plant Growth Regulators for Fruit Crops</i> .
Petal fall						
Plum curculio	General Comments: • These products are toxic to bees. Do not apply when bees are active or hives are in the orchard. Refer to label for specific bee toxicity statements.					
	4A	Actara 25 WG	385 g/ha	12 hours	60 days	No product specific comments.
		Calypso 480 SC	440 mL/ha	12 hours	30 days	Optimal timing is petal fall plus 3 days. However, if monitoring indicates plum curculio is in the orchard prior to this timing, then insecticides should be applied at Petal fall .
		Clutch 50 WDG	210 g/ha	12 hours	7 days	Make first application before populations reach damaging thresholds. If pest pressure continues, reapply 10–14 days later. May provide suppression of codling moth and oriental fruit moth if applied at appropriate timing and high rate.
	4C+5	TwinGuard	500 g/ha	12 hours	7 days	Suppression only. Apply at first sign of feeding damage after bloom. Reapply, if necessary, after 14 days.
	28	Exirel	1.0–1.5 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Petal fall						
Pear psylla	General Comments: These products are toxic to bees. Do not apply when bees are active or hives are in the orchard. Refer to label for specific bee toxicity statements.					
	3	Ambush 500 EC	400 mL/ha	when dry	7 days	No product specific comments.
	4A	Actara 25 WG	385 g/ha	12 hours	60 days	No product specific comments.
		Assail 70 WP	120 g/ha	12 hours ¹ / 48 hours ³ /6 days ²	7 days	No product specific comments.
		Calypso 480 SC	290–440 mL/ha	12 hours	30 days	Apply high rate under high pressure. Apply when populations have reached economic thresholds and the majority of the population is in early instar stages. Reapply at 7–10-day intervals if needed.
		Clutch 50 WDG	280–420 g/ha	12 hours	7 days	Make first application before populations reach damaging thresholds. If pest pressure continues, reapply 10–14 days later. May provide suppression of codling moth and oriental fruit moth if applied at appropriate timing and high rate.
	4D	Sivanto Prime	0.75–1.0 L/ha + horticultural oil (0.25% v/v)	12 hours	14 days	Suppression only. See comments on this product for Pear psylla at Green tip . Where possible, rotate with products outside of Group 4.
	6	Agri-Mek SC	170 mL/ha	12 hours	28 days	Apply no later than 21 days after petal fall for best results. Apply with 10 L oil and a minimum of 1,000 L of water per ha, when most mites are in the nymph stage. Do not use within 14 days of Supra Captan or Maestro. May cause russetting to d'Anjou and other sensitive varieties. Maximum 1 application per season. Alternate yearly with other insecticides.
	21	Nexter	600 g/ha	24 hours	25 days	There is little commercial experience with this product for psylla.
Obliquebanded leafroller	23	Movento 240 SC	365 mL/ha	12 hours	7 days	Control may not be apparent for 2–3 weeks. Tank-mix with an adjuvant/additive with spreading and penetrating properties at a suggested rate of 0.2% v/v (2 L/1,000 L water). See label and Table 5–9. <i>Adjuvants Used in Ontario</i> , page 346, for further details. Do not tank-mix with sulphur. Do not use when fruit is present due to the possibility of injury. If psylla pressure is high, use the higher labelled rate of 435 mL/ha.
	General Comments: - Spray in orchards with historical pest problems or high pest pressure (1–2% of the terminals or buds have larvae or damage). - For overwintering generation, apply at Petal fall. Place pheromone traps in orchards at petal fall to monitor summer generation. - Resistance to organophosphate insecticides is present in some commercial orchards. Cross-resistance between pyrethroids and Intrepid is possible. See <i>Pest Resistance to Fungicides, Insecticides and Miticides</i>, page 393. - Some of these products are toxic to bees. Do not apply when bees are active or hives are in the orchard. Refer to label for specific bee toxicity statements.					
	1	Imidan WP	2.68 kg/ha	7 days ^{1†} /14 days ⁵ / 30 days ²	14 days	No product specific comments.
	4C+5	TwinGuard	500 g/ha	12 hours	7 days	Reapply 14 days later if larvae activity is extended.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Petal fall						
Obliquebanded leafroller (cont'd)	5	Delegate	420 g/ha	12 hours	7 days	No product specific comments.
		Entrust * or Success	364 mL/ha 182 mL/ha	when dry	7 days	No product specific comments.
	11	Bioprotec CAF * or Dipel 2X DF * or Foray 48 BA	4 L/ha 1.125 kg/ha 2.8 L/ha	12 hours	0 days	Product must be consumed to be effective. Spray when and where pests are actively feeding. Apply in a high-volume spray to ensure thorough coverage on both sides of the leaf. Apply to young larvae, early in infestation. Death of insect may take several days. Reapply at 5–7-day intervals if larvae activity is extended. Acidify spray mix to below pH 7.0 and apply on cloudy days or in the evening.
	18	Intrepid	750 mL/ha	12 hours	14 days	No product specific comments.
	28	Altacor	285 g/ha	12 hours	5 days	No product specific comments.
		Exirel	0.5–1.0 L/ha	12 hours	3 days	Reapply 10 days later if larvae activity is extended. Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
Green fruitworm	General Comments: Green fruitworm is a sporadic pest in pear. Larval size and damage are very similar to obliquebanded leafroller but green fruitworm is active earlier in the season (throughout bloom and early fruit set).					
	1	Imidan WP	2.68 kg/ha	7 days ^{1†} /14 days ⁵ / 30 days ²	14 days	No product specific comments.
	11	Bioprotec CAF * or Dipel 2X DF *	4 L/ha 1.125 kg/ha	12 hours	0 days	Product must be consumed to be effective. Spray when and where pests are actively feeding. Apply in a high-volume spray to ensure thorough coverage on both sides of the leaf. Apply to young larvae, early in infestation. Death of insect may take several days. Reapply at 5–7-day intervals if larvae activity is extended. Acidify spray mix to below pH 7.0 and apply on cloudy days or in the evening.
	28	Altacor	215 g/ha	12 hours	5 days	No product specific comments.
	General Comments: - Apply before mite populations build up. - Miticides are best applied alone. Thorough spray coverage is essential for good control. - For resistance management, do not use more than once per season.					
Pear rust mite	6	Agri-Mek SC	170 mL/ha	12 hours	28 days	Apply no later than 21 days after Petal fall for best results. Apply with 10 L oil and a minimum of 1,000 L of water/ha, when most mites are in the nymph stage. Do not use within 14 days of Supra Captan or Maestro. May cause russetting to d'Anjou and other sensitive varieties. To prevent russetting fruit, apply at prebloom or petal fall.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Petal fall						
Pear rust mite (cont'd)	21	Nexter	300 g/ha	24 hours	25 days	May also provide control of blister mite.
	23	Envidor 240 SC	750 mL/ha	12 hours	7 days	Control may not be apparent for 2–3 weeks. May also provide control blister mite.
European red mite, Two-spotted spider mite	General Comments: • Apply before mite populations build up. • Miticides are best applied alone. Thorough spray coverage is essential for good control. • For resistance management, do not use more than once per season.					
	6	Agri-Mek SC	170 mL/ha	12 hours	28 days	Apply no later than 21 days after petal fall for best results. Apply with 10 L oil and a minimum of 1,000 L of water per ha, when most mites are in the nymph stage. Do not use within 14 days of Supra Captan or Maestro. May cause russetting to d'Anjou and other sensitive varieties.
	10	Apollo SC	300 mL/ha	12 hours ¹ /48 hours ²	21 days	No product specific comments.
	20	Kanemite 15 SC	2.1 L/ha	12 hours	14 days	No product specific comments.
	21	Nexter	300 g/ha	24 hours	25 days	Controls all motile stages, not eggs.
	23	Envidor 240 SC	750 mL/ha	12 hours	7 days	Active on all life stages. Control may not be apparent for 2–3 weeks. Apply before mite populations build up.
	25	Nealta	1 L/ha	12 hours	7 days	Active on all life stages. The addition of a surfactant registered on the crop may improve activity.
	NC	Vegol Crop Oil *	2% v/v	12 hours	0 days	See comments on this product for European red mite at Green tip .
Scab	Use one of the fungicides listed for Scab at Green tip . Rotate among fungicide groups for resistance management. If wet weather persists, additional sprays will be needed for scab control before First cover . Where there is a problem, spray at Petal fall and First cover . Do not use Sercadis after Bloom .					
Tree growth modification	Use one of the products listed for Tree growth modification at Bloom .					
Fruit size	NC	Cilis Plus	0.5–2.5 L/ 1,000 L water	12 hours	28 days	Make 2–4 applications at 3–10 day intervals. May cause thinning in easy to thin varieties. Apply in a high-volume spray to ensure thorough coverage. Apply when temperatures are greater than 20°C during and after application. For additional information, visit http://www.omafra.gov.on.ca/english/crops/hort/tender_fruit.html and click on <i>Thinning of Tree Fruit</i> .
Special spray (when monitoring indicates the need at Petal fall)						
Codling moth (first generation)	General Comments: • Timing is critical for effective control. Use pheromone traps to time sprays. • Apply insecticides within specified degree-days (DDC, base 10°C) after first sustained moth catch. For information on calculating degree days, see Appendix B: <i>Degree-Day Modeling</i>, page 428.					
	1	Imidan WP	2.68 kg/ha	7 days ^{1†} /14 days ⁵ / 30 days ²	14 days	Apply at 138 DDC.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Special spray (when monitoring indicates the need at Petal fall)						
Codling moth (first generation) (cont'd)	4A	Assail 70 WP	170 g/ha	12 hours ¹ / 48 hours ³ /6 days ²	7 days	Apply at 111–138 DDC. Residues last 10–14 days. Do not apply as a border spray.
		Calypso 480 SC	440 mL/ha	12 hours	30 days	
	4C+5	TwinGuard	500 g/ha	12 hours	7 days	Apply at 138 DDC. Residues last 10–14 days. Do not apply as a border spray.
	5	Delegate	420 g/ha	12 hours	7 days	Apply at 138 DDC. Residues last 10–14 days. Do not apply as a border spray.
	28	Altacor	215 g/ha	12 hours	5 days	Apply at 138 DDC. Residues last 10–14 days. Do not apply as a border spray. Do not tank-mix or make sequential applications of Exirel with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
		Exirel	500–750 mL/ha	12 hours	3 days	
San Jose scale	4C+5	TwinGuard	500 g/ha	12 hours	7 days	Apply when crawlers are active in orchards with a history of scale. Reapply, if necessary, after 14 days.
First cover (7–14 days after Petal fall)						
Pear psylla	General Comments: • Apply when the majority of the population is in early instar stages. • Where plum curculio is a later-season problem, use one of the insecticides listed for Plum curculio at Petal fall.					
	3	Ambush 500 EC or Perm-Up EC or Pounce 384 EC	400 mL/ha 520 mL/ha 520 mL/ha	when dry	7 days	Resistance to these pyrethroid insecticides was widespread in the past and may still be present.
		Decis 5 EC	350 mL/ha	12 hours	7 days	
		Mako or Up-Cyde 2.5 EC	175 mL/ha 280 mL/ha	12 hours	7 days	
		Matador 120 EC or Silencer 120 EC	83 mL/ha	24 hours	7 days	
	4A	Actara 25 WG	385 g/ha	12 hours	60 days	No product specific comments.
		Assail 70 WP	120 g/ha	12 hours ¹ / 48 hours ³ /6 days ²	7 days	No product specific comments.
		Calypso 480 SC	290–440 mL/ha	12 hours	30 days	Apply high rate under high pressure. Apply when populations have reached economic thresholds. Reapply at 7–10-day intervals if needed.
		Clutch 50 WDG	280–420 g/ha	12 hours	7 days	Make first application before populations reach damaging thresholds. If pest pressure continues, reapply 10–14 days later. May provide suppression of codling moth and oriental fruit moth if applied at the appropriate timing and high rate.
	4D	Sivanto Prime	0.75–1.0 L/ha + horticultural oil (0.25% v/v)	12 hours	14 days	Suppression only. See comments on this product for Pear psylla at Green tip . Where possible, rotate with products outside of Group 4.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
First cover (7–14 days after Petal fall)						
Pear psylla (cont'd)	6	Agri-Mek SC	170 mL/ha	12 hours	28 days	Apply no later than 21 days after Petal fall . Apply with 10 L oil and a minimum of 1,000 L of water per ha. May cause russetting to d'Anjou and other sensitive varieties. Do not use oil within 14 days of Supra Captan or Maestro.
	21	Nexter	600 g/ha	24 hours	25 days	There is little commercial experience with this product for psylla.
	NC	Surround WP *	50 kg/ha	when dry	0 days	Must be applied before pest is present. Make 2 initial applications at 50 kg/ha, 7 days apart, to establish a base layer. Continue at 7–14-day intervals, using a reduced rate of 25 kg/ha, to maintain even coverage of developing fruits. Do not use as a border spray. Light to moderate rain will help distribute product. Reapply after heavy rain, strong wind or overhead irrigation. White film will remain on fruit if applied near harvest unless crop will be washed and waxed. Do not use with anti-foaming agents, spreader/stickers or summer oils.
San Jose scale	General Comments: • Apply when crawlers are active.					
	4C+5	TwinGuard	500 g/ha	12 hours	7 days	Reapply, if necessary, after 14 days. Where possible, rotate with products outside of Group 4.
	4D	Sivanto Prime	0.75–1.0 L/ha + horticultural oil (0.25% v/v)	12 hours	14 days	See comments on this product for San Jose scale at Green tip . Where possible, rotate with products outside of Group 4.
Scab	Use one of the fungicides listed for Scab at Green tip . Reduce rate of Sylitt to 3.65 L/ha in cover sprays. For additional fruit protection, tank-mix Nova or Inspire Super with the full rate of a protectant fungicide. Do not use Sercadis after Bloom .					
Tree growth modification	Use one of the products listed for Tree growth modification at Bloom .					
Fruitlet thinning	NC	Cilis Plus	2.5–10.1 L/1,000 L water	12 hours	28 days	Apply when fruitlets are 5–15 mm in diameter. Maximum 2 applications per season for thinning. Apply when temperatures are greater than 20°C during and after application. For additional information, visit http://www.omafra.gov.on.ca/english/crops/hort/tender_fruit.html and click on <i>Thinning of Tree Fruit</i> .
		MaxCel	2.65–10.65 L/1,000 L water	12 hours	86 days	
Summer sprays						
Pear psylla	Use one of the insecticides listed for Pear psylla at First cover . Apply when majority of the population is in early instar stages. Do not exceed maximum number of applications for any product. See Table 5–5. <i>Products Used on Pears</i> , page 323.					
Obliquebanded leafroller	Use one of the insecticides listed for Obliquebanded leafroller at Petal fall . Place pheromone traps in orchards by June to monitor adult populations. Insecticides for summer-generation larvae should be applied at 240–280 DDC (base 6.1°C) after first sustained moth catch. For information on calculating degree days, see Appendix B: <i>Degree-Day Modeling</i> , page 428. When applied for leafroller control, these products also control other leaf-feeding caterpillars. Resistance to organophosphate insecticides is present in some commercial apple orchards. Cross-resistance to pyrethroids, Confirm and Intrepid is possible. See <i>Pest Resistance to Fungicides, Insecticides and Miticides</i> , page 393.					

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Summer sprays						
Pear rust mite		Use one of the miticides listed for Pear rust mite and/or European red mite at Petal fall with the exception of Agri-Mek. Examine orchards for mite injury about July 15–20, or 10–15 days after using a pyrethroid. Kanemite is not effective on rust mites.				
San Jose scale		Use one of the products listed for San Jose scale at First cover . Apply when crawlers are active.				
Tree growth modification		Use one of the products listed for Tree growth modification at Bloom .				
Second cover						
Oriental fruit moth	General Comments: - Apply within the appropriate degree-days (DDC, base 7.2°C) after sustained first-generation moth catch for best results. For information on calculating degree days, see Appendix B: <i>Degree-Day Modeling</i>, page 428. - Monitor populations and reapply 10–14 days later if required.					
	3	Decis 5 EC	250 mL/ha	12 hours	7 days	No product specific comments.
	4A	Assail 70 WP	240 g/ha	12 hours ¹ / 48 hours ³ /6 days ²	7 days	Apply before first egg hatch, or 750–778 DDC. Apply in a minimum spray volume of 1,000 L/ha. Do not apply more than once every 12 days. Will also control plum curculio.
		Calypso 480 SC	440 mL/ha	12 hours	30 days	Apply before first egg hatch, or 750–778 DDC.
	5	Delegate	420 g/ha	12 hours	7 days	Apply at first egg hatch, or 778–833 DDC.
	28	Altacor	215 g/ha	12 hours	5 days	Apply at first egg hatch, or 778–833 DDC. Do not tank-mix or make sequential applications of Exirel with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
		Exirel	500–750 mL/ha	12 hours	3 days	
Scab		Use one of the fungicides listed for Scab at Green tip . Reduce rate of Sylitt to 3.65 L/ha in cover sprays. Do not use Sercadis after Bloom . Check preharvest intervals in Table 5–5. <i>Products Used on Pears</i> , page 323, before spraying early maturing pears.				
Special sprays (when monitoring indicates the need about mid-August and early September)						
Check preharvest interval before spraying early maturing pears. See Table 5–5. <i>Products Used on Pears</i> , page 323.						
Codling moth (second generation)	General Comments: - Timing is critical for effective control. Use pheromone traps to time sprays. - For second-generation codling moth, spray at specified degree-days (DDC, base 10°C) after first-generation sustained moth catch. For information on calculating degree days, see Appendix B: <i>Degree-Day Modeling</i>, page 428. - Codling moth can infest pear as maturation and ripening begins. Bosc pears can be heavily infested and may require 2 preharvest sprays about 2 weeks apart.					
	1	Imidan WP	2.68 kg/ha	7 days ^{1†} /14 days ⁵ / 30 days ²	14 days	Apply at 667–694 DDC. Residues last 18–21 days.
	4A	Assail 70 WP	170 g/ha	12 hours ¹ / 48 hours ³ /6 days ²	7 days	Apply at 639–667 DDC. Residues last 10–14 days. Do not apply as a border spray.

¹ General re-entry. ² Hand thinning. ³ Hand labour and scouting. ⁴ Harvest. ⁵ Pick your own harvest. [†] Personal protective equipment required for some activities. See label.

— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

¹ General re-entry. ² Hand thinning. ³ Hand labour and scouting. ⁴ Harvest. ⁵ Pick your own harvest. [†] Personal protective equipment required for some activities. See label.

— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Special sprays (when monitoring indicates the need about mid-August and early September) Check preharvest interval before spraying early maturing pears. See Table 5–5. <i>Products Used on Pears</i> , page 323.						
Codling moth (second generation) (cont'd)	5	Delegate	420 g/ha	12 hours	7 days	Apply at 667–694 DDC. Residues last 10–14 days. Do not apply as a border spray.
	28	Altacor	215 g/ha	12 hours	5 days	Apply at 667–694 DDC. Residues last 10–14 days. Do not apply as a border spray. Do not tank-mix or make sequential applications of Exirel with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
		Exirel	500–750 mL/ha	12 hours	3 days	
Oriental fruit moth	General Comments: - Apply within the appropriate degree-days (DDC, base 7.2°C) after sustained first-generation moth catch. Monitor populations and reapply 10–14 days later if required. For information on calculating degree days, see Appendix B: <i>Degree-Day Modeling</i>, page 428. - A spray 7–10 days prior to harvest is recommended in orchards with a history of oriental fruit moth damage or adjacent to or near peaches.					
	3	Decis 5 EC	250 mL/ha	12 hours	7 days	Apply at first egg hatch, or 1,361–1,389 DDC.
	4A	Assail 70 WP	240 g/ha	12 hours ¹ / 48 hours ³ /6 days ²	7 days	Apply before first egg hatch, or 1,305–1,333 DDC.
	5	Delegate	420 g/ha	12 hours	7 days	Apply at first egg hatch, or 1,361–1,389 DDC.
	28	Altacor	215 g/ha	12 hours	5 days	Apply at first egg hatch, or 1,361–1,389 DDC. Do not tank-mix or make sequential applications of Exirel with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
		Exirel	500–750 mL/ha	12 hours	3 days	
	Brown marmorated stink bug	General Comments: - Breeding populations of this pest are present in Ontario. Check ontario.ca/stinkbug for updates on pest development, registered products and management strategies. - There are currently no thresholds established. Apply when insects are first detected or early damage found. - These products are toxic to beneficial insects and should be used only when necessary.				
4A		Actara 25 WG	385 g/ha	12 hours	60 days	Suppression only.
		Clutch 50 WDG	210–420 g/ha	12 hours	7 days	Suppression only.
Postharvest fruit treatment						
Blue mould	General Comments: Postharvest treatment may be necessary during wet harvest seasons. These treatments will prolong storage time while providing control of postharvest diseases.					
	1	Mertect SC	500 mL/500 L water	—	post-harvest	For use in dip tank or drencher. Continuous agitation required. Follow label instructions. Does not control any blue mould (Penicillium) or grey mould (Botrytis), which is resistant to benzimidazole fungicides (e.g., Benlate).
	2	Scholar 230 SC	496 mL/378 L water	—	post-harvest	Also controls grey mould. See label for dip and drench instructions.
	NC	Bio-Save 10 LP	500 g/300 L water	—	post-harvest	Suppression only. See label for dip and drench instructions.

¹ General re-entry. ² Hand thinning. ³ Hand labour and scouting. ⁴ Harvest. ⁵ Pick your own harvest. † Personal protective equipment required for some activities. See label.

— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Table 5–5. Products Used on Pears

Use this table as a guide but refer to product label for specific information.

The **preharvest interval** is the number of days between the last spray and first harvest.

The **restricted entry interval** is the minimum interval that must be observed between the application of the pesticide and work in the treated crop without protective equipment. If no re-entry period is stated on the label, assume it is 12 hours.

The **maximum applications** is the labelled maximum number or product amount applied for the growing season and may be higher than what is recommended for resistance management or for the preservation of beneficial insects.

Products listed as **potentially organic** may be acceptable for organic use based on *Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec publication Bulletin D'Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with certifying body to verify the acceptability of any product prior to using it.

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
Products used for insect and mite control or suppression							
Actara 25 WG	28408	thiamethoxam	4A	60 days	12 hours	2	—
Agri-Mek SC	31607	abamectin	6	28 days	12 hours	max. 340 mL/ha	—
Altacor	28981	chlorantraniliprole	28	5 days	12 hours	3 (max. 645 g/ha)	—
Ambush 500 EC	14882	permethrin	3	7 days	when dry	—	—
Apollo SC	21035	clofentezine	10	21 days	12 hours ¹ /48 hours ²	1	—
Assail 70 WP	27128	acetamiprid	4A	7 days	12 hours ¹ /48 hours ³ / 6 days ²	4	—
Bioprotec CAF	26854	<i>Bacillus thuringiensis</i>	11	0 days	12 hours	—	✓
Calypso 480 SC	28429	thiacloprid	4A	30 days	12 hours	3 (max. 875 mL/ha)	—
Clutch 50 WDG	29382	clothianidin	4A	7 days	12 hours	2 (max. 420 g/ha)	—
Decis 5 EC	22478	deltamethrin	3	7 days	12 hours	3	—
Delegate	28778	spinetoram	5	7 days	12 hours	3	—
Dipel 2X DF	26508	<i>Bacillus thuringiensis</i>	11	0 days	12 hours	—	✓
Entrust	30382	spinosad	5	7 days	when dry	3	✓
Envidor 240 SC	28051	spirodiclofen	23	7 days	12 hours	1	—
Exirel	30895	cyantraniliprole	28	3 days	12 hours	4	—
Foray 48 BA	24978	<i>Bacillus thuringiensis</i>	11	0 days	12 hours	—	—
Imidan WP	29064	phosmet	1B	14 days	7 days ¹ /14 days ⁴ /30 days ²	5	—
Intrepid	27786	methoxyfenozide	18	14 days	12 hours	2	—
Isomate CM/OFM TT	29352	pheromone, oriental fruit moth and codling moth	NC	—	—	—	✓

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. U = Mode of action has not been determined.

— = Information is not specified on the product label. ✓ = Potentially organic. Check with certifying body.

¹ General re-entry. ² Hand thinning. ³ Hand labour and scouting activities. ⁴ Pick your own harvest. ⁵ Harvest. ⁶ Maximum 6 applications per season with no more than 2 dormant applications.

⁷ Depends on rate. See label * Personal protective equipment required for certain activities. See label.

Table 5–5. Products Used on Pears (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
Products used for insect and mite control or suppression							
Isomate OFM TT	31419	pheromone, oriental fruit moth	NC	—	—	—	✓
Kanemite 15 SC	28641	acequinocyl	20B	14 days	12 hours	2	—
Mako	30316	cypermethrin	3	7 days	12 hours	2	—
Malathion 85 E	8372	malathion	1B	3 days	12 hours ¹ /48 hours ⁵ / 72 hours	2	—
Matador 120 EC	24984	lambda-cyhalothrin	3	7 days	24 hours	1	—
Movento 240 SC	28953	spirotetramat	23	7 days	12 hours	max. 1.83 L/ha	—
Nealta	31284	cyflumetofen	25	7 days	12 hours	2	—
Nexter	25135	pyridaben	21	25 days	24 hours	2	—
Perm-Up EC	28877	permethrin	3	7 days	12 hours	—	—
Pounce 384 EC	16688	permethrin	3	7 days	when dry	—	—
Purespray Green Spray Oil 13 E	27666	mineral oil	NC	—	12 hours	2 (dormant)	✓
Silencer 120 EC	29052	lambda-cyhalothrin	3	7 days	24 hours	1	—
Sivanto Prime	31452	flupyradifurone	4D	14 days	12 hours	max. 2 L/ha	—
Success	26835	spinosad	5	7 days	when dry	3	—
Superior 70 Oil	9542 14981	mineral oil	NC	prebloom	12 hours	—	✓
Surround WP	27469	kaolin	NC	0 days	12 hours	—	✓
TwinGuard	31442	sulfoxaflor + spinetoram	4C+5	7 days	12 hours	2	—
Up-Cyde 2.5 EC	28795	cypermethrin	3	7 days	12 hours	3	—
Vegol Crop Oil	32408	canola oil	NC	0 days	12 hours	2/4 ⁶	✓
Products used for disease control or suppression							
Aprovia Top 195 EC	31526	benzovindiflupyr	3+7	30 days	12 hours	max. 2.57 L/ha	—
Bio-Save 10 LP	29673	<i>Pseudomonas syringae</i>	NC	postharvest	—	—	—
Blossom Protect	30552	<i>Aureobasidium pullulans</i>	NC	—	when dry	5	✓
Buran	30601	garlic powder	NC	0 days	when dry	—	✓
Copper 53 W	9934	tri-basic copper sulphate	M	2 days	48 hours	10	✓
Copper Spray	19146	copper oxychloride	M	2 days	48 hours	10	✓
Cueva	31825	copper octanoate	M	1 day	4 hours	10	—

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. U = Mode of action has not been determined.

— = Information is not specified on the product label. ✓ = Potentially organic. Check with certifying body.

¹ General re-entry. ² Hand thinning. ³ Hand labour and scouting activities. ⁴ Pick your own harvest. ⁵ Harvest. ⁶ Maximum 6 applications per season with no more than 2 dormant applications.

⁷ Depends on rate. See label * Personal protective equipment required for certain activities. See label.

Table 5–5. Products Used on Pears (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
Products used for disease control or suppression							
Double Nickel LC	31887	<i>Bacillus amyloliquefaciens</i>	44	0 days	when dry	—	✓
Flint	30619	trifloxystrobin	11	14 days	12 hours ¹ /4 days ²	4	—
Fontelis	30331	penthiopyrad	7	28 days	12 hours	max. 4.5 L/ha	—
Inspire Super	30827	difenoconazole + cyprodinil	3+9	14 days	12 hours	4	—
Kasumin 2L	20591	kasugamycin	24	90 days	12 hours	4	—
Lime Sulphur	16465	calcium polysulphide	M	120 days	48 hours	1	✓
Luna Tranquility	30510	fluopyram + pyrimethanil	7+9	72 days	12 hours ¹ /24 hours ²	4 (max. 3.2 L/ha)	—
Maestro 80 DF	26408	captan	M	7 days	48 hours	—	—
Mertect SC	13975	thiabendazole	1	postharvest	—	—	—
Nova	22399	myclobutanil	3	14 days	12 hours	6	—
Pristine WG	27985	boscalid + pyraclostrobin	7+11	5 days	when dry ¹ /5 days ⁵ / 12 days ²	4	—
Scala SC	28011	pyrimethanil	9	72 days	12 hours ¹ /24 hours ²	4	—
Scholar 230 SC	29528	fludioxonil	12	postharvest	—	1	—
Senator 50 SC	32096	thiophanate-methyl	1	1 day	12 hours	max. 1.75 L/ha	—
Sercadis	31697	fluxpyroxad	7	0 days	12 hours	4	—
Serenade OPTI	31666	<i>Bacillus subtilis</i>	44	0 days	when dry	—	✓
Sovran	26257	kresoxim-methyl	11	30 days	48 hours	4	—
Streptomycin 17	10305	streptomycin	25	30 days	24 hours ¹ /7 days ³ / 14 days ²	3	—
Supra Captan 80 WDG	24613	captan	M	7 days	48 hours	—	—
Syllit 400 FL	28351	dodine	U12	7 days	48 hours	2 ⁷	—
Thinners and plant growth regulators							
Cilis Plus	29210	6-benzylaminopurine	NC	28 days	12 hours	max. 21.3 L/ha	—
MaxCel	28851	6-benzyladenine	NC	86 days	12 hours	max. 22.5 L/ha	—
Promalin SL	16636	6-benzyladenine, gibberellins A ₄ A ₇	NC	28 days	12 hours	—	—

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. U = Mode of action has not been determined.

— = Information is not specified on the product label. ✓ = Potentially organic. Check with certifying body.

¹ General re-entry. ² Hand thinning. ³ Hand labour and scouting activities. ⁴ Pick your own harvest. ⁵ Harvest. ⁶ Maximum 6 applications per season with no more than 2 dormant applications.

⁷ Depends on rate. See label * Personal protective equipment required for certain activities. See label.

PLUM CALENDAR

In this section:

- Read the product label and follow all safety precautions. 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>.
- Consult the product label for suggested water volumes. Otherwise, use enough water to ensure thorough spray coverage. Where the product rate is listed in amount per 1,000 L, and if a water volume is not provided on the label, use enough water to wet the foliage to the near drip point.
- For preharvest interval, restricted entry interval and maximum number of applications, see Table 5–6. *Products Used on Plums*, page 337.
- **Products are listed by chemical group and in alphabetical order within each group. The order does not reflect efficacy.** See Table 5–7. *Activity of Fungicides on Tender Fruit Diseases and Impact on Honeybees*, page 340 and Table 5–8. *Activity of Insecticides and Miticides on Tender Fruit Pests and Impact on Honeybees*, page 343, for efficacy ratings.
- Where a product in the calendar is followed by a “*”, it is potentially acceptable for organic use based on *Ministère de l’Agriculture, des Pêcheries et de l’Alimentation du Québec publication Bulletin D’Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with your certifying body to verify the acceptability of any product prior to using it.

Resistance Management

To delay development of resistance to insecticides, miticides and fungicides, follow resistance management guidelines outlined in *Resistance Management Strategies*, page 393. The chemical group is indicated in the “Group” column before the “Product” column. Products belonging to the same chemical group are grouped together in the calendar. Multi-site (M) fungicides are not prone to resistance and do not have to be rotated. Some products are not classified to mode of action (NC) and the mode of action has not been determined for others (U or UN). Group 44 and 46 fungicides are not known to be prone to resistance.

Fungicide resistance management

Take the following steps to avoid rapid development of fungicide resistance:

- Do not reduce rates below those specified on the label.
- Do not use products containing the same chemical group in consecutive applications.
- Do not use Senator, Rovral, Bumper, Jade, Fitness, Tilt, Funginex, Indar, Quash, Cantus, Fontelis, Kenja, Sercadis or Pristine when sporulating lesions of target disease are present.
- Do not exceed maximum number of applications on the label.

Insecticide resistance management

Take the following steps to avoid development of insecticide resistance:

- For pests with discrete generations (oriental fruit moth, borers, obliquebanded leafroller), do not use insecticides from the same group for more than one generation. Within a generation, if more than one spray is required, use a product from the same chemical group.
- For pests with overlapping generations (aphids, mites), do not use products containing the same chemical group in consecutive applications.

Bee Toxicity

Some insecticides are toxic to bees and other pollinating insects. Use of insecticides on flowering crops requires careful management to avoid negative effects on pollinators. Some insecticides cannot be applied prior to or during bloom. Insecticides should not be applied when tree fruit are in bloom. Do not apply insecticides when bees are active. Before and after bloom, bees may be present on flowering cover crops and weeds—do not allow drift of insecticides onto these or other flowering crops. Always follow label precautions to avoid impacts on bees. For more information, see *Bee Poisoning*, page 5, and honeybee toxicity ratings in Table 5–7. *Activity of Fungicides on Tender Fruit Diseases and Impact on Honeybees*, page 340, and Table 5–8. *Activity of Insecticides and Miticides on Tender Fruit Pests and Impact on Honeybees*, page 343.

Buffer Zones

Leave a suitable buffer zone between treatment area and adjacent sensitive areas, such as hedgerows, woodlots and freshwater habitats. Zones may vary depending on the product used, growth stage of the crop and method of application including the use of drift-reducing technology. Check the pesticide label for requirements.

Use Health Canada’s online spray drift calculator to modify the buffer zone specified on the label based on weather conditions, category of spray equipment and 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. Unfortunately, this model does not account for carrier volume, travel speed or crop stage.

Observing buffer zones is a legal requirement. A record of the buffer zone modification, if any, must be retained for at least one year from the time of application.

Crop Nutrition

Crop nutrition is important for plant growth, fruit quality development and the acquisition of adequate cold hardiness by tree fruit. For fruit crops, soil testing, plant tissue analysis and visual deficiency symptoms all play an important role in assessing and monitoring the crop's nutritional status. For more information, visit http://www.omafra.gov.on.ca/english/crops/hort/tender_fruit.html (click on *Soil Management, Fertilizer Use, Crop Nutrition and Cover Crops for Fruit Production*) and see OMAFRA Publication 611, *Soil Fertility Handbook*. For soil testing and plant tissue analysis services, see Appendix E: *Accredited Soil-Testing Laboratories in Ontario*, page 435.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Dormant (before bud break)						
Black knot	Prune out all black knots from commercial orchards during the dormant period before bud break. Make the cut 15 cm below the swelling. Collect and burn all prunings with knots. Knots left lying on the ground are a source of spores that start new infections. Destroy infected wild and neglected plums near the orchard.					
Green tip (just as buds are bursting)						
European red mite, Scale	General Comments: • Apply in a high-volume spray to ensure thorough coverage. • Tolerance has not been determined for all varieties. Test a small area of each variety prior to spraying the whole block. • Do not use within 14 days of Supra Captan or Maestro. • Do not use within 48 hours of freezing temperatures, when temperatures are high (over 30°C), prior to rain or to heat- or moisture-stressed trees.					
	NC	Purespray Green Spray Oil 13 E *	20 L/1,000 L water	12 hours	—	In addition to the precautions in general comments, do not use within 14 days of Ambush, Perm-Up, Pounce, Bravo, Echo or sulphur.
		Superior 70 Oil *	20 L/1,000 L water	12 hours	prebloom	In addition to the precautions in general comments, do not use within 30 days of sulphur.
		Vegol Crop Oil *	20 L/1,000 L water	12 hours	0 days	In addition to the precautions in general comments, do not use within 14 days of copper or 30 days of sulphur. Do not apply to wet foliage.
Oriental fruit moth	NC	Isomate OFM TT *	125–250 dispensers/ha	—	—	Reduces mating of oriental fruit moth. Apply dispensers before flight begins. Place dispensers in lateral branches in the upper canopy in a uniform manner across the orchard block. Use high rate for high pest pressure areas or during initial year of treatment. Dispensers are designed to last for the entire season. For information on mating disruption, see OMAFRA Factsheet 03–079, <i>Mating Disruption for Management of Insect Pests</i> . Apply supplemental control measures when conditions warrant.

¹ General re-entry. ² Hand thinning. ³ Harvest. ⁴ Pick your own harvest. † Personal protective equipment required for certain activities. See label.

— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Popcorn (when blossoms show white)						
Brown rot (blossom blight stage)	General Comments: • Knock off fruit mummies when pruning. • Make 2–3 fungicide applications from early to full bloom. • Group 1, 2, 3, 7 and 11 fungicides are locally systemic and will penetrate petals to protect fruit from infection as blossoms start to open. Consult labels for information on drying time required before rain.					
	M	Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	Do not mix with lime. During excessive moisture and cold, leaf spots can appear on copper-sensitive crops. If concerned about tree sensitivity, test first on a small area.
		Fracture	1.5–3.3 L/ha	12 hours	0 days	Under high disease pressure, use high rate. Do not mix with foliar fertilizers.
	1	Senator 50 SC	700 mL/1,000 L water	12 hours	1 day	No product specific comments.
	2	Rovral WP	1.5 kg/ha	12 hours	1 day	No product specific comments.
	3	Bumper 432 EC or Fitness or Jade or Tilt 250 E	300 mL/ha 300 mL/ha 500 mL/ha 500 mL/ha	12 hours 72 hours 72 hours 72 hours	3 days	No product specific comments.
		Funginex DC	2.5 L/ha	48 hours	prebloom	No product specific comments.
		Indar	140 g/ha	12 hours	1 day	No product specific comments.
		Quash	175–245 g/ha	12 hours ¹ /9 days ²	14 days	Under high disease pressure, use high rate.
	7	Cantus WDG	370 g/ha	12 hours	0 days	No product specific comments.
		Fontelis	1.0–1.75 L/ha	12 hours	0 days	Contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
		Kenja 400 SC	913 mL/ha	12 hours	1 day	No product specific comments.
		Sercadis	333 mL/ha	12 hours	0 days	Use a non-ionic surfactant at a rate of 0.125% v/v (1.25 L in 1,000 L water). See Table 5–9. <i>Adjuvants Used in Ontario</i> , page 346.
	7+11	Pristine WG	750 g/ha	when dry ¹ / 24 hours ³ /10 days ²	1 day	Do not tank-mix or make sequential applications with Exirel.
	44	Serenade OPTI *	1.1–1.7 kg/ha	when dry	0 days	Suppression only.
	P5	Regalia Maxx *	0.125–0.25% v/v in 500–1,000 L water/ha	when dy	0 days	Suppression only. Apply before symptoms develop. Use 0.125% (1.25 L in 1,000 L water) in a tank-mix with other brown rot fungicides or 0.25% (2.5 L in 1,000 L water) in rotation with brown rot fungicides.

¹ General re-entry. ² Hand thinning. ³ Harvest. ⁴ Pick your own harvest. † Personal protective equipment required for certain activities. See label.

— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Popcorn (when blossoms show white)						
Black knot	General Comments: - Fungicides will not provide adequate control of black knot without proper orchard sanitation (pruning, removal and burning of black knots). Inspect all plums in early summer. Cut out and burn new knots and those missed. - Apply fungicide sprays to protect the developing shoots between Popcorn (prebloom) and First cover every 3–5 days in wet weather. Spore release may be delayed in dry springs. Under these conditions extend fungicide coverage to Second cover.					
	M	Maestro 80 DF or Supra Captan 80 WDG	4.5 kg/ha	48 hours	2 days	Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Fontelis or Exirel.
	3	Bumper 432 EC or Fitness or Jade or Tilt 250 E	300 mL/ha 300 mL/ha 500 mL/ha 500 mL/ha	12 hours 72 hours 72 hours 72 hours	3 days	Suppression only.
		Indar	149 g/ha	12 hours	1 day	No product specific comments.
Bloom						
DO NOT APPLY INSECTICIDES WHILE PLUM TREES ARE IN BLOOM. SEE BEE POISONING, PAGE 5.						
Brown rot (blossom blight stage)	Use one of the fungicides listed for Blossom blight/brown rot at Popcorn . Do not use Sercadis after Petal fall .					
Black knot	Use one of the fungicides listed for Black knot at Popcorn .					
Petal fall to Shuck						
Brown rot (blossom blight stage)	Use one of the fungicides listed for Blossom blight/brown rot at Popcorn . Do not use Sercadis after Petal fall .					
Black knot	Use one of the fungicides listed for Black knot at Popcorn .					
Shuck split to Shuck fall (when most of the shucks are off)						
Brown rot	General Comments: Group 3, 7 and 11 fungicides are locally systemic. Consult labels for information on drying time required before rain.					
	M	Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	Do not mix with lime. During excessive moisture and cold, leaf spots can appear on copper-sensitive crops. If concerned about sensitivity of trees, test first on a small area.
		Fracture	1.5–3.3 L/ha	12 hours	0 days	Under high disease pressure, use high rate. Do not mix with foliar fertilizers.
		Kumulus DF * or Microscopic Sulphur WP * or Microthiol Disperss *	22.5 kg/ha 6.5 kg/1,000 L water 22.5 kg/ha	24 hours	1 day	Do not use within 14 days of Purespray Green Spray Oil and 30 days of Vegol Crop Oil or Superior Oil.

¹ General re-entry. ² Hand thinning. ³ Harvest. ⁴ Pick your own harvest. † Personal protective equipment required for certain activities. See label.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

¹ General re-entry. ² Hand thinning. ³ Harvest. ⁴ Pick your own harvest. † Personal protective equipment required for certain activities. See label.

— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Shuck split to Shuck fall (when most of the shucks are off)						
Brown rot (cont'd)	M	Maestro 80 DF or Supra Captan 80 WDG	4.5 kg/ha	48 hours	2 days	May cause leaf injury and spotting of the fruit on Stanley and Japanese plums under slow drying conditions. Do not use within 14 days of oil or as a tank-mix or sequential application with products such as Fontelis or Exirel.
	3	Bumper 432 EC or Fitness or Jade or Tilt 250 E	300 mL/ha 300 mL/ha 500 mL/ha 500 mL/ha	12 hours 72 hours 72 hours 72 hours	3 days	No product specific comments.
		Indar	140 g/ha	12 hours	1 day	No product specific comments.
		Quash	175–280 g/ha	12 hours ¹ /9 days ²	14 days	Under high disease pressure, use high rate.
	7	Cantus WDG	370 g/ha	12 hours	0 days	No product specific comments.
		Fontelis	1.0–1.75 L/ha	12 hours	0 days	Contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., captan, sulphur) may cause crop safety issues. See label for tank-mix restrictions.
		Kenja 400 SC	913 mL/ha	12 hours	1 day	No product specific comments.
	7+11	Pristine WG	750 g/ha	when dry ¹ / 24 hours ³ /10 days ²	1 day	Do not tank-mix or make sequential applications with Exirel.
	44	Serenade OPTI *	1.1–1.7 kg/ha	when dry	0 days	Suppression only.
	P5	Regalia Maxx *	0.125–0.25% v/v in 500–1,000 L water/ha	when dry	0 days	Suppression only. Apply before symptoms develop. Use 0.125% (1.25 L in 1,000 L water) in a tank-mix with other brown rot fungicides or 0.25% (2.5 L in 1,000 L water) in rotation with brown rot fungicides.
Black knot	Use one of the fungicides listed for Black knot at Popcorn . Supra Captan and Maestro may cause leaf injury and spotting of the fruit on Stanley and Japanese plums under slow drying conditions.					
Oriental fruit moth	General Comments: - Where mating disruption is being used, a pesticide application is generally not required at this time. - Apply within the specified degree-day (DDC, base 7.2°C) after sustained moth catch. Reapply 10–14 days later if catch is extended. For information on calculating degree days, see Appendix B: <i>Degree-Day Modeling</i>, page 428.					
	4A	Assail 70 WP	120–240 g/ha	12 hours ¹ /6 days ²	7 days	Apply at 100–140 DDC. For optimum activity, use high rate in a minimum of 1,000 L water/ha. Do not apply more than once every 12 days.
	5	Delegate	420 g/ha	12 hours	3 days	Apply at 194–208 DDC.
	15	Rimon 10 EC	1.35–3.35 L/ha	12 hours	14 days	Apply at 111–139 DDC.
	18	Intrepid	1.5 L/ha	12 hours	14 days	Apply at 100–140 DDC.
	28	Altacor	285 g/ha	12 hours	1 day	Apply at 194–208 DDC. Do not tank-mix or make sequential applications of Exirel with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
		Exirel	500–750 mL/ha	12 hours	3 days	

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Shuck split to Shuck fall (when most of the shucks are off)						
Plum curculio	General Comments: • These products are toxic to bees. Do not apply when bees are active or hives are in the orchard. Refer to label for specific bee toxicity statements.					
	1	Imidan WP	2.68 kg/ha	7 days ^{1†} /14 days ⁴ /30 days ²	14 days	No product specific comments.
	3	Perm-Up EC or Pounce 384 EC	520 mL/ha	when dry	7 days	Under high pressure, may provide suppression only.
		Silencer 120 EC	104 mL/ha	24 hours	7 days	
		Up-Cyde 2.5 EC	400 mL/ha	12 hours	7 days	
	4A	Assail 70 WP	240 g/ha	12 hours ¹ /6 days ²	7 days	Under high pressure, may provide suppression only.
		Clutch 50 WDG	210 g/ha	12 hours	7 days	May provide suppression of oriental fruit moth if applied at the appropriate timing and at 420 g/ha.
	28	Exirel	1.0–1.5 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
Peachtree borer, Lesser peachtree borer	NC	Isomate-PTB Dual *	375–675 dispensers/ha	—	—	Reduces mating of peachtree and lesser peachtree borer. Apply dispensers before borer flight begins in the spring, i.e., typically apply at or before shuck split. Use high rate for high pest pressure areas or during initial year of treatment. Dispensers are designed to last the entire season. Insecticides for peachtree borer may be needed as long as the maximum labelled rate for the season is not exceeded. Populations are generally reduced over time where mating disruption is used for several seasons. For more information, see OMAFRA Factsheet 03–079, <i>Mating Disruption for Management of Insect Pests</i> .
First cover (12 days after Shuck fall)						
Brown rot, Black knot	Use one of the fungicides listed for Brown rot and black knot at Shuck split to Shuck fall . Rotate among fungicide groups for resistance management. Supra Captan and Maestro may cause leaf injury and spotting on the fruit of Stanley and Japanese plums.					
Plum curculio	Use one of the insecticides listed for Plum curculio at Shuck split to Shuck fall .					
Second cover						
Check preharvest interval before spraying early maturing plums. See Table 5–6. <i>Products Used on Plums</i> , page 337.						
Brown rot	Use one of the fungicides listed for Brown rot at Shuck split to Shuck fall . Rotate among fungicide groups for resistance management. During wet weather, repeat applications between pickings. Comply with preharvest intervals in Table 5–6. <i>Products Used on Plums</i> , page 337. Do not make more than 2 applications of Bumper, Fitness, Jade or Tilt in the 3 weeks prior to harvest.					
Black knot	Use one of the fungicides listed for Brown rot and black knot at Shuck split to Shuck fall . Black knot spore release may be delayed in dry springs. Under these conditions extend fungicide coverage for black knot to Second cover . Supra Captan and Maestro may cause leaf injury and spotting on the fruit of Stanley and Japanese plums.					

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Second cover						
Check preharvest interval before spraying early maturing plums. See Table 5–6. <i>Products Used on Plums</i> , page 337.						
Oriental fruit moth	General Comments: • If mating disruption is being used, a pesticide application is not required for the second generation. • For second-generation larvae, apply insecticides within the specified degree-day (DDC, base 7.2°C) after sustained first-generation moth catch. For information on calculating degree days, see Appendix B: <i>Degree-Day Modeling</i>, page 428. • Spray all varieties. This generation may require 2 insecticide sprays. Check the harvest dates of early varieties and do not spray within the preharvest interval.					
	4A	Assail 70 WP	120–240 g/ha	12 hours ¹ /6 days ²	7 days	Apply at 583–611 DDC and again at 750–778 DDC. For optimum activity, use high rate in a minimum spray volume of 1,000 L/ha. Do not apply more than once every 12 days.
	5	Delegate	420 g/ha	12 hours	3 days	Apply at 639–667 DDC and again at 805–833 DDC.
	15	Rimon 10 EC	1.35–3.35 L/ha	12 hours	14 days	Apply at 555–583 DDC and again at 722–750 DDC.
	28	Altacor	215–285 g/ha	12 hours	1 day	Apply at 639–667 DDC and again at 805–833 DDC. Do not tank-mix or make sequential applications of Exirel with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
		Exirel	500–750 mL/ha	12 hours	3 days	
Prepick						
Check preharvest interval before spraying early maturing plums. See Table 5–6. <i>Products Used on Plums</i> , page 337.						
Brown rot	Use one of the fungicides listed for Brown rot at Shuck split to Shuck fall . Rotate among fungicide groups for resistance management. Supra Captan and Maestro may cause leaf injury and spotting of the fruit on Stanley and Japanese plums under slow drying conditions.					
Oriental fruit moth	General Comments: • Between generations, rotate among insecticide groups for resistance management. See <i>Pest Resistance to Fungicides, Insecticides and Miticides</i>, page 393. • For third-generation larvae, apply insecticides within the specified degree-day (DDC, base 7.2°C) after sustained first-generation moth catch. For information on calculating degree days, see Appendix B: <i>Degree-Day Modeling</i>, page 428.					
	4A	Assail 70 WP	120–240 g/ha	12 hours ¹ /6 days ²	7 days	Apply at 1,111–1,167 DDC and again at 1,305–1,389 DDC.
	5	Delegate	420 g/ha	12 hours	3 days	Apply at 1,167–1,222 DDC and again at 1,361–1,389 DDC.
	15	Rimon 10 EC	1.35–3.35 L/ha	12 hours	14 days	Apply at 1,083–1,139 DDC and again at 1,277–1,305 DDC.
	28	Altacor	215–285 g/ha	12 hours	1 day	Apply at 1,167–1,222 DDC and again at 1,361–1,389 DDC. Do not tank-mix or make sequential applications of Exirel with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
		Exirel	500–750 mL/ha	12 hours	3 days	

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¹ General re-entry. ² Hand thinning. ³ Harvest. ⁴ Pick your own harvest. † Personal protective equipment required for certain activities. See label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Special sprays (when monitoring indicates the need)						
Aphids	General Comments: • Apply only if aphids are a problem. • Thorough coverage and calm warm conditions are needed for good control.					
	4A	Admire 240 Flowable	230 mL/ha	24 hours	7 days	Apply in a minimum spray volume of 500 L/ha.
		Clutch 50 WDG	140–210 g/ha	12 hours	7 days	No product specific comments.
	4C	Closer	100–200 mL/ha	12 hours	7 days	Registered for green peach aphid. Where possible, rotate with products outside of Group 4.
	4C+5	TwinGuard	250 g/ha	12 hours	7 days	Registered for green peach aphid. Also controls oriental fruit moth. Where possible, rotate with products outside of Group 4.
	23	Movento 240 SC	365 mL/ha	12 hours	7 days	Most effective on young stages of aphids. Control may not be apparent for 2–3 weeks. Under high pressure, a second application may be necessary 2 weeks later. Tank-mix with an adjuvant/additive with spreading and penetrating properties at a suggested rate of 0.2% v/v (2 L/1,000 L water). See label and Table 5–9. <i>Adjuvants Used in Ontario</i> , page 346, for further details. Do not tank-mix with sulphur.
	28	Exirel	0.75–1.0 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions.
	29	Beleaf 50 SG	120–160 g/ha	12 hours ¹ /48 hours ²	14 days	No product specific comments.
	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	Suppression only. Apply in a high-volume spray to ensure thorough coverage. Tolerance has not been determined for all varieties. Test a small area of each variety prior to spraying the whole block. Do not use within 14 days of Supra Captan, Maestro, Ambush, Perm-Up, Pounce, Bravo, Echo or sulphur. Do not use within 48 hours of freezing temperatures, when temperatures are high (over 30°C), prior to rain or to heat- or moisture-stressed trees.
		Vegol Crop Oil *	2% v/v	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage at a rate of 2% v/v (20 L/1,000 L water). Tolerance has not been determined for all varieties. Test a small area of each variety prior to spraying the whole block. Do not use within 14 days of Supra Captan, Maestro or copper and 30 days of sulphur. Do not use within 48 hours of freezing temperatures, when temperatures are high (over 30°C), prior to rain or to heat- or moisture-stressed trees. Do not apply to wet foliage.

¹ General re-entry. ² Hand thinning. ³ Harvest. ⁴ Pick your own harvest. † Personal protective equipment required for certain activities. See label.

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Disease, Insect or Other	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Special sprays (when monitoring indicates the need)						
Peachtree borer, Lesser peachtree borer	15	Rimon 10 EC	1.4 L/1,000 L water	12 hours	14 days	Apply at 3-week intervals starting 7–10 days after first trap catch. Direct sprays with a handgun to cover trunk and scaffold limbs thoroughly. Check preharvest intervals and do not spray if fruit is to be harvested during this period.
Obliquebanded leafroller	General Comments: For summer generations, apply at 240–280 DDC (base 6.1°C) after first sustained moth catch. If larval activity is extended, reapply after 10–14 days.					
	4C+5	TwinGuard	250–500 g/ha	12 hours	7 days	Also controls oriental fruit moth.
	5	Delegate	420 g/ha	12 hours	3 days	No product specific comments.
		Entrust * or Success	364 mL/ha 182 mL/ha	when dry	3 days	No product specific comments.
	15	Rimon 10 EC	1.35–3.35 L/ha	12 hours	14 days	No product specific comments.
	28	Altacor	285 g/ha	12 hours	1 day	No product specific comments.
		Exirel	0.5–1.0 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with strobilurins, coppers or captan fungicides. See product label for other tank-mix restrictions.
Japanese beetle	1	Imidan WP	2.68 kg/ha	7 days ^{1†} /14 days ⁴ / 30 days ²	14 days	No product specific comments.
	28	Altacor	285 g/ha	12 hours	1 day	Suppression only.
		Exirel	1.0–1.5 L/ha	12 hours	3 days	Do not tank-mix or make sequential applications with strobilurins, copper or captan fungicides. See product label for other tank-mix restrictions
Brown marmorated stink bug	General Comments: - Breeding populations of this pest are present in Ontario. Check ontario.ca/stinkbug for updates on pest development, registered products and management strategies. - There are currently no thresholds established. Apply when insects first detected or early damage found.					
	4A	Clutch 50 WDG	210–420 g/ha	12 hours	7 days	Suppression only. This product is toxic to beneficial insects and should be used only when necessary.
San Jose scale	4C+5	TwinGuard	500 g/ha	12 hours	7 days	Apply when crawlers are active in orchards with a history of scale. Reapply, if necessary, after 14 days. Also controls oriental fruit moth.
	NC	Vegol Crop Oil *	2% v/v	12 hours	0 days	See comments on this product for San Jose scale at Green tip .
Postharvest fruit treatment						
Blue mould, Grey mould, Brown rot, Rhizopus rot	12	Scholar 230 SC	496 mL/378 L water	—	post-harvest	Postharvest treatment may be necessary during wet harvest seasons. These treatments will prolong storage time while providing control of postharvest diseases. See label for dip and drench instructions. Should not be used on plums intended for processing into prunes.

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Table 5–6. Products Used on Plums

Use this table as a guide but refer to product label for specific information.

The **preharvest interval** is the number of days between the last spray and first harvest.

The **restricted entry interval** is the minimum interval that must be observed between the application of the pesticide and work in the treated crop without protective equipment. If no re-entry period is stated on the label, assume it is 12 hours.

The **maximum applications** is the labelled maximum number or product amount applied for the growing season and may be higher than what is recommended for resistance management or for the preservation of beneficial insects.

Products listed as **potentially organic** may be acceptable for organic use based on *Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec publication Bulletin D'Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with certifying body to verify the acceptability of any product prior to using it.

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
Products used for insect and mite control or suppression							
Admire 240 Flowable	24094	imidacloprid	4A	7 days	24 hours	2	—
Altacor	28981	chlorantraniliprole	28	1 day	12 hours	3 (max. 645 g/ha)	—
Assail 70 WP	27128	acetamiprid	4A	7 days	12 hours ¹ /6 days ²	4	—
Beleaf 50 SG	29796	flonicamid	29	14 days	12 hours ¹ /48 hours ²	3	—
Closer	30826	sulfoxaflor	4C	7 days	12 hours	2	—
Clutch 50 WDG	29382	clothianidin	4A	7 days	12 hours	2 (max. 420 g/ha)	—
Delegate	28778	spinetoram	5	3 days	12 hours	3	—
Entrust	30382	spinosad	5	3 days	when dry	3	✓
Exirel	30895	cyantraniliprole	28	3 days	12 hours	4	—
Imidan WP	29064	phosmet	1B	14 days	7 days ^{1*} /14 days ³ / 30 days ²	3	—
Intrepid	27786	methoxyfenozide	18	14 days	12 hours	1	—
Isomate OFM TT	31419	pheromone, oriental fruit moth	NC	—	—	—	✓
Isomate-PTB Dual	30042	pheromone, peachtree borer, lesser peachtree borer	NC	—	—	—	✓
Movento 240 SC	28953	spirotetramat	23	7 days	12 hours	max. 1.12 L/ha	—
Perm-Up EC	28877	permethrin	3	7 days	12 hours	—	—
Pounce 384 EC	16688	permethrin	3	7 days	when dry	—	—
Purespray Green Spray Oil 13 E	27666	mineral oil	NC	—	12 hours	2/8 ⁴	✓
Rimon 10 EC	28881 28515	novaluron	15	14 days	12 hours	3	—

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Plant extract. U = Mode of action has not been determined.

— = Information is not specified on the product label. ✓ = Potentially organic. Check with certifying body.

¹ General re-entry. ² Hand thinning. ³ Pick-your-own harvest. ⁴ Maximum 10 applications per season with no more than 2 dormant applications. ⁵ Maximum 6 applications per season with no more than 2 dormant applications. ⁶ No more than 2 applications in the 3 weeks prior to harvest. ⁷ Harvest. * Personal protective equipment required for certain activities. See label.

Table 5–6. Products Used on Plums (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
Products used for insect and mite control or suppression							
Silencer 120 EC	29052	lambda-cyhalothrin	3	7 days	24 hours	3	—
Success	26835	spinosad	5	3 days	when dry	3	—
Superior 70 Oil	9542 14981	mineral oil	NC	prebloom	12 hours	—	✓
TwinGuard	31442	sulfoxaflor + spinetoram	4C+5	7 days	12 hours	2	—
Up-Cyde 2.5 EC	28795	cypermethrin	3	7 days	12 hours	3	—
Vegol Crop Oil	32408	canola oil	NC	0 days	12 hours	2/4 ⁵	✓
Products used for disease control or suppression							
Bumper 432 EC	28017	propiconazole	3	3 days	12 hours	5 ⁶	—
Cantus WDG	30141	boscalid	7	0 days	12 hours	5	—
Cueva	31825	copper octanoate	M	1 day	4 hours	15	—
Fitness	32639	propiconazole	3	3 days	72 hours	5 ⁶	—
Fontelis	30331	penthioopyrad	7	0 days	12 hours	max. 4.5 L/ha	—
Fracture	32139	BLAD polypeptide	M	0 days	12 hours	3	—
Funginex DC	27686	triforine	3	prebloom	48 hours	3	—
Indar	27294	fenbuconazole	3	1 day	12 hours	7	—
Jade	24030	propiconazole	3	3 days	72 hours	5 ⁶	—
Kenja 400 SC	31758	isofetamid	7	1 day	12 hours	3	—
Kumulus DF	18836	sulphur	M	1 day	24 hours	8	✓
Maestro 80 DF	26408	captan	M	2 days	48 hours	—	—
Microscopic Sulphur WP	14653	sulphur	M	1 day	24 hours	8	✓
Microthiol Disperss	29487	sulphur	M	1 day	24 hours	8	✓
Pristine WG	27985	boscalid + pyraclostrobin	7+11	1 day	when dry ¹ /24 hours ⁷ / 10 days ²	5	—
Quash	30402	metconazaole	3	14 days	12 hours ¹ /9 days ²	1	—
Regalia Maxx	30199	extract of <i>Reynoutria sachalinensis</i>	P5	0 days	when dry	—	✓
Rovral WP	15213	iprodione	2	1 day	12 hours	—	—

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— = Information is not specified on the product label. ✓ = Potentially organic. Check with certifying body.

¹ General re-entry. ² Hand thinning. ³ Pick-your-own harvest. ⁴ Maximum 10 applications per season with no more than 2 dormant applications. ⁵ Maximum 6 applications per season with no more than 2 dormant applications. ⁶ No more than 2 applications in the 3 weeks prior to harvest. ⁷ Harvest. * Personal protective equipment required for certain activities. See label.

Table 5–6. Products Used on Plums (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic
Products used for disease control or suppression							
Scholar 230 SC	29528	fludioxonil	12	postharvest	—	1	—
Senator 50 SC	32096	thiophanate-methyl	1	1 day	12 hours	max. 4.9 L/ha	—
Sercadis	31697	fluxapyroxad	7	0 days	12 hours	3	—
Serenade OPTI	31666	<i>Bacillus subtilis</i>	44	0 days	when dry	—	✓
Supra Captan 80 WDG	24613	captan	M	2 days	48 hours	—	—
Tilt 250 E	19346	propiconazole	3	3 days	72 hours	5 ⁶	—

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. P = Plant extract. U = Mode of action has not been determined.

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¹ General re-entry. ² Hand thinning. ³ Pick-your-own harvest. ⁴ Maximum 10 applications per season with no more than 2 dormant applications. ⁵ Maximum 6 applications per season with no more than 2 dormant applications. ⁶ No more than 2 applications in the 3 weeks prior to harvest. ⁷ Harvest. * Personal protective equipment required for certain activities. See label.

Notes on Fungicides, Insecticides and Miticides for Tender Fruit

Use the information in the following tables to assist with choosing the best product for the pest complex present. Consider the life stage present, history

of the pest, weather and resistance management strategies, as well as the activity of each product to pests and beneficial insects.

In this section:

Table 5–7. Activity of Fungicides on Tender Fruit Diseases and Impact on Honeybees, on this page.

Table 5–8. Activity of Insecticides and Miticides on Tender Fruit Pests and Impact on Honeybees, page 343.

Table 5–7. Activity of Fungicides on Tender Fruit Diseases and Impact on Honeybees

Use fungicides only for diseases listed on the product label for the crop. The information provided in this table is based on information from other areas. It is intended to assist the grower in choosing the best fungicide for control of diseases listed on the product label, while managing resistance and avoiding unnecessary sprays. Efficacy can be affected by rate of the product.

Group	Fungicide	Honeybee Toxicity ¹	Brown rot blossom blight	Brown rot fruit phase	Peach scab	Peach leaf curl	Bacterial canker/spot	Powdery mildew	Rhizopus rot	Cherry leaf spot	Black knot	Pear scab	Registered for use on:					
													Apricots	Cherries	Peaches	Nectarines	Plums	Pears
M	Bravo ZN	NT	3 *	NA	4	4 *	0	0	0	4 *	4 *	NA	NR	✓	✓	✓	NR	NR
M	Copper Spray	NT	1 *	1 *	0	2 *	2 *	0	0	1 *	0	NA	NR	✓	✓	✓	NR	NR
M	Cueva	NT	2 *	2 *	—	2 *	2 *	2	0	—	0	2 *	✓	✓	✓	✓	✓	✓
M	Echo 90 DF	NT	3 *	NA	4	4 *	0	0	0	4 *	4 *	NA	NR	✓	✓	✓	NR	NR
M	Ferbam 76 WDG	NT	3 *	NA *	—	4 *	0	0	NA	2 *	0	1 *	✓	✓	✓	NR	✓	✓

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. U = Mode of action has not been determined.

MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.

NT = Relatively non-toxic to bees. ¹ Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

0 = Not effective. 1 = Slightly effective/suppression. 2 = Fair. 3 = Good. 4 = Very good. NA = Not used at this timing for this pest. — = No information is available.

* (shaded area) = Pest is listed on the product label for control or suppression.

✓ = Registered on the crop, but not necessarily for all diseases. NR = Not registered for use on this crop.

Source: Various U.S. extension publications, scientific journal articles, Canadian Pest Management Research Reports and Plant Disease Management Reports (APS).

Table 5–7. Activity of Fungicides on Tender Fruit Diseases and Impact on Honeybees (cont'd)

Group	Fungicide	Honeybee Toxicity ¹	Brown rot blossom blight	Brown rot fruit phase	Peach scab	Peach leaf curl	Bacterial canker/spot	Powdery mildew	Rhizopus rot	Cherry leaf spot	Black knot	Pear scab	Registered for use on:					
													Apricots	Cherries	Peaches	Nectarines	Plums	Pears
M	Fracture	NT	1 *	1 *	—	—	—	1	—	—	—	NA	✓	✓	✓	✓	✓	NR
M	Granuflo-T	NT	3 *	3 *	3 *	3	0	0	0	—	3	NA	NR	NR	✓	NR	✓	NR
M	Guardsman Copper Oxychloride 50	NT	1 *	0	0	2 *	2 *	0	0	1 *	0	NA	NR	✓	✓	NR	NR	NR
M	Kumulus DF	NT	2 *	1 *	3 *	0	0	2 *	0	1	1	1 *	NR	✓	✓	NR	✓	✓
M	Maestro 80 DF	MT	3 *	3 *	4 *	2	0	0	1	3 *	2 *	3 *	✓	✓	✓	✓	✓	✓
M	Microscopic Sulphur WP	NT	2 *	1 *	3 *	0	0	2 *	0	1	1 *	1 *	NR	✓	✓	NR	✓	✓
M	Microthiol Disperss	NT	2 *	1 *	3 *	0	0	2 *	0	1	1	1 *	NR	✓	✓	✓	✓	✓
M	Supra Captan 80 WDG	MT	3 *	3 *	4 *	2	0	0	1	3 *	2 *	3 *	✓	✓	✓	✓	✓	✓
1	Senator 50 SC	NT	3 *	3 *	3	2	0	3	—	3	—	2	NR	✓	✓	✓	✓	✓
2	Rovral WP	NT	4 *	4 *	0	0	0	0	2	2	0	NA	✓	✓	✓	✓	✓	NR
3	Bumper 432 EC	NT	4 *	4 *	3	0	0	3	4	3 *	1 *	NA	✓	✓	✓	✓	✓	NR
3	Funginex DC	NT	3 *	NA	0	0	0	3	—	3	0	NA	NR	✓	✓	NR	✓	NR
3	Indar	NT	4 *	4 *	3	0	0	3	0	3	2 *	NA	✓	✓	✓	✓	✓	NR
3	Jade	NT	4 *	4 *	3	0	0	3	4	3 *	1 *	—	✓	✓	✓	✓	✓	NR
3	Nova	NT	3 *	NA	3	0	0	4 *	0	3 *	0	3	NR	✓	✓	✓	NR	✓
3	Quash	NT	4 *	4 *	3	0	0	1 *	0	1 *	0	0	✓	✓	✓	✓	✓	NR
3	Tilt 250 E	NT	4 *	4 *	3	0	0	3	4	3 *	1 *	NA	✓	✓	✓	✓	✓	NR
3+7	Aprovia Top 195 EC	NT	NA	NA	NA	NA	NA	NA	NA	NA	NA	4 *	NR	NR	NR	NR	NR	✓
3+9	Inspire Super	NT	NA	NA	NA	NA	NA	NA	NA	NA	NA	3 *	NR	NR	NR	NR	NR	✓

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. U = Mode of action has not been determined.

MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.

NT = Relatively non-toxic to bees. ¹ Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

0 = Not effective. 1 = Slightly effective/suppression. 2 = Fair. 3 = Good. 4 = Very good. NA = Not used at this timing for this pest. — = No information is available.

* (shaded area) = Pest is listed on the product label for control or suppression.

✓ = Registered on the crop, but not necessarily for all diseases. NR = Not registered for use on this crop.

Source: Various U.S. extension publications, scientific journal articles, Canadian Pest Management Research Reports and Plant Disease Management Reports (APS).

Table 5–7. Activity of Fungicides on Tender Fruit Diseases and Impact on Honeybees (cont'd)

Group	Fungicide	Honeybee Toxicity ¹	Brown rot blossom blight	Brown rot fruit phase	Peach scab	Peach leaf curl	Bacterial canker/spot	Powdery mildew	Rhizopus rot	Cherry leaf spot	Black knot	Pear scab	Registered for use on:					
													Apricots	Cherries	Peaches	Nectarines	Plums	Pears
7	Cantus WDG	NT	4 *	4 *	—	0	NA	2	0	—	—	NA	✓	✓	✓	✓	✓	NR
7+11	Pristine WG	NT	4 *	4 *	4	0	NA	2 *	4 *	4 *	—	3 *	✓	✓	✓	✓	✓	✓
9	Scala SC	NT	4 *	4 *	0	0	0	0	0	0	0	2	NR	NR	NR	NR	✓	✓
11	Flint	NT	0	0	3	0	0	1 *	0	4 *	0	3 *	✓	✓	✓	✓	✓	✓
11	Sovran	NT	—	—	—	—	—	—	—	—	—	3 *	NR	NR	NR	NR	NR	✓
11	Cabrio EG	NT	1 *	1	3	0	0	4 *	4	4	—	NA	✓	✓	✓	✓	✓	NR
12	Scholar 230 SC	NT	NA	4 *	NA	NA	NA	NA	4 *	NA	NA	NA	✓	✓	✓	✓	✓	✓
13	Quintec	MT	0	0	0	0	0	4 *	—	0	0	NA	✓	✓	✓	✓	✓	NR
17	Elevate 50 WDG	NT	4 *	4 *	0	0	0	0	0	0	0	NA	NR	✓	✓	✓	NR	NR
44	Serenade OPTI	NT	1 *	1 *	—	—	—	1	—	—	—	1 *	✓	✓	✓	✓	✓	✓
NC	Buran	NT	N	NA	NA	NA	NA	NA	NA	NA	NA	1 *	NR	NR	NR	NR	NR	✓
NC	Purespray Green Spray Oil 13 E	—	0	0	0	0	0	3 *	0	0	0	0	✓	✓	✓	✓	✓	✓
NC	Vegol Crop Oil	—	0	0	0	0	0	3 *	0	0	0	0	✓	✓	✓	✓	✓	✓
U8	Vivando SC	NT	0	0	0	0	0	3 *	0	0	0	0	NR	✓	✓	✓	NR	✓
U12	Equal 65 WP	NT	—	—	—	3	—	—	—	3 *	—	3	NR	✓	NR	NR	NR	✓
U12	Syllit 400 FL	NT	NA	NA	NA	3 *	NA	NA	NA	3 *	NA	3 *	NR	✓	✓	✓	NR	✓

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. U = Mode of action has not been determined.

MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.

NT = Relatively non-toxic to bees. ¹ Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

0 = Not effective. 1 = Slightly effective/suppression. 2 = Fair. 3 = Good. 4 = Very good. NA = Not used at this timing for this pest. — = No information is available.

* (shaded area) = Pest is listed on the product label for control or suppression.

✓ = Registered on the crop, but not necessarily for all diseases. NR = Not registered for use on this crop.

Source: Various U.S. extension publications, scientific journal articles, Canadian Pest Management Research Reports and Plant Disease Management Reports (APS).

Table 5–8. Activity of Insecticides and Miticides on Tender Fruit Pests and Impact on Honeybees

Use these products only for pests listed on the product label for the crop. The information provided in this table is based on information from other areas. It is intended to assist the grower in choosing the best insecticide for control of pests listed on the product label, while managing resistance and avoiding unnecessary sprays for non-target pests. Efficacy can be affected by rate of the product.

Group	Product Name	Honeybee Toxicity ¹	Oriental fruit moth	Plum curculio	Tarnished plant bug	Obliquebanded leafroller	Japanese beetle	Aphids	Cherry fruit fly	Spotted wing drosophila†	Mites	Pear psylla	Codling moth	Registered for use on:					
														Apricots	Cherries	Peaches	Nectarines	Plums	Pears
1B	Imidan WP	HT	2 *	4 *	2 *	2 *	3 *	1	2 *	3 *	1 *	1	3 * R	NR	t	✓	NR	✓	✓
1B	Lorsban 50 W	HT	2 * 1 st gen	—	4	—	—	—	—	—	0	—	—	NR	NR	✓	✓	NR	NR
1B	Malathion 85 E	HT	— *	— *	—	— *	—	— *	—	3 *	— *	— *	— *	✓	✓	✓	✓	✓	✓
3	Ambush 500 EC	HT	4 *	2 *	3 *	4	3	0	2	3	0	3 *	2 *	NR	NR	✓	✓	✓	✓
3	Decis 5 EC	HT	3 *	1	3	3	0	1	—	3	0	4 *	3	NR	NR	✓	✓	NR	✓
3	Mako	HT	3 *	3 *	3 *	4	3	2	2	3	0	3 *	2 *	NR	NR	✓	✓	NR	✓
3	Matador 120 EC	HT	3 *	3 *	3 *	4	3	2 * gpa	2 *	3–4	0	3 *	3 *	NR	✓	✓	✓	✓	✓
3	Perm-Up EC	HT	4 *	2 *	2 *	4	3	2	—	3	0	3 *	3 *	NR	NR	✓	✓	✓	✓
3	Pounce 384 EC	HT	4 *	2 *	2 *	4	3	2	—	3	0	3 *	3 *	NR	NR	✓	✓	✓	✓
3	Silencer 120 EC	HT	3 *	3 *	3 *	4	3	2 * gpa	2 *	3–4	0	3 *	3 *	NR	✓	✓	✓	✓	✓
3	Up-Cyde 2.5 EC	HT	3 *	3 *	3 *	4	3	2	2	3	0	3	3	NR	NR	✓	✓	✓	✓
4A	Actara 25 WG	HT	0	3 *	3	0	1	3 *	0	1	0	4 *	0	NR	✓	NR	NR	NR	✓
4A	Admire 240 F	HT	0	0	1	0	1	3 *	3 *	0	0	0	—	✓	✓	✓	✓	✓	✓

HT = Highly toxic to bees. Severe losses may be expected if used when bees are present at treatment time or within a few days thereafter.

MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.

NT = Relatively non-toxic to bees.

I = Irritant. May act as a repellent to bees if white film barrier present on plant tissue while foraging.

¹ Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

² May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

0 = Not effective. 1 = Slightly effective/suppression. 2 = Fair. 3 = Good. 4 = Very good. NA = Not used at this timing for this pest. MD = Mating disruption.

— = No information is available. R = Resistance detected in Ontario. E = Early season application. 1st gen = First generation only. gpa = Green peach aphid. bca = Black cherry aphid.

ow = Overwintering generation. * (shaded area) = Pest is listed on the product label for control or suppression. † = Product efficacy may be reduced due to long preharvest intervals.

✓ = Registered on the crop, but not necessarily for all insects. NR = Not registered for use on this crop. t = Tart cherry only.

Source: Various U.S. extension publications, scientific journal articles, Canadian Pest Management Research Reports, Plant Disease Management Reports (APS), Arthropod Management Reports (ESA).

Table 5–8. Activity of Insecticides and Miticides on Tender Fruit Pests and Impact on Honeybees (cont'd)

Group	Product Name	Honeybee Toxicity ¹	Oriental fruit moth	Plum curculio	Tarnished plant bug	Obliquebanded leafroller	Japanese beetle	Aphids	Cherry fruit fly	Spotted wing drosophila†	Mites	Pear psylla	Codling moth	Registered for use on:					
														Apricots	Cherries	Peaches	Nectarines	Plums	Pears
4A	Assail 70 WP	MT	4 *	1–2 *	2	1	2	4	1 *	1	0	3 *	3 *	✓	✓	✓	✓	✓	✓
4A	Calypso 480 SC	NT	3 *	3 *	3	—	—	—	—	—	0	3 *	3 *	NR	NR	NR	NR	NR	✓
4A	Clutch 50 WDG	HT	3 *	3 *	—	—	2	4 *	—	—	0	3 *	1 *	✓	✓	✓	✓	✓	✓
4C	Closer	HT	0	0	0	0	0	3 *	0	—	0	0	0	✓	✓	✓	✓	✓	✓
4C+5	TwinGuard	MT	4 *	2 *	0	4 *	0	3 *	0	3–4	0	3	3 *	✓	✓	✓	✓	✓	✓
4D	Sivanto Prime	MT	—	—	—	—	—	4 *	—	—	—	— *	—	NR	NR	NR	NR	NR	✓
5	Delegate	HT	4 *	2 *	0	4 *	0	0	2	2–3 *	0	3	3 *	✓	✓	✓	✓	✓	✓
5	Entrust	HT	1	0	0	3 *	0	0	3 *	3	0	0	1	✓	✓	✓	✓	✓	✓
5	GF-120 Fruit Fly Bait	HT	—	0	0	0	0	0	3 *	0	0	0	0	NR	✓	NR	NR	NR	NR
5	Success	HT	1	0	0	3 *	0	0	3	3	0	0	1	✓	✓	✓	✓	✓	✓
6	Agri-Mek SC	HT	0	0	0	0	0	0	—	0	4 *	4 *	0	NR	NR	NR	NR	NR	✓
10	Apollo SC	NT	0	0	0	0	0	0	0	0	3 * E	0	0	NR	NR	✓	✓	NR	✓
11	Bioprotec CAF	NT	1	0	0	3 *	0	0	0	0	0	0	1	✓	✓	✓	✓	✓	✓
11	Dipel 2X DF	NT	1	0	0	3 *	0	0	0	0	0	0	1	✓	✓	NR	NR	✓	✓
11	Foray 48 BA	NT	0	0	0	3 *	0	0	0	0	0	0	0	NR	NR	NR	NR	NR	✓

HT = Highly toxic to bees. Severe losses may be expected if used when bees are present at treatment time or within a few days thereafter.

MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.

NT = Relatively non-toxic to bees.

I = Irritant. May act as a repellent to bees if white film barrier present on plant tissue while foraging.

¹ Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

² May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

0 = Not effective. 1 = Slightly effective/suppression. 2 = Fair. 3 = Good. 4 = Very good. NA = Not used at this timing for this pest. MD = Mating disruption.

— = No information is available. R = Resistance detected in Ontario. E = Early season application. 1st gen = First generation only. gpa = Green peach aphid. bca = Black cherry aphid.

ow = Overwintering generation. * (shaded area) = Pest is listed on the product label for control or suppression. † = Product efficacy may be reduced due to long preharvest intervals.

✓ = Registered on the crop, but not necessarily for all insects. NR = Not registered for use on this crop. t = Tart cherry only.

Source: Various U.S. extension publications, scientific journal articles, Canadian Pest Management Research Reports, Plant Disease Management Reports (APS), Arthropod Management Reports (ESA).

Table 5–8. Activity of Insecticides and Miticides on Tender Fruit Pests and Impact on Honeybees (cont'd)

Group	Product Name	Honeybee Toxicity ¹	Oriental fruit moth	Plum curculio	Tarnished plant bug	Obliquebanded leafroller	Japanese beetle	Aphids	Cherry fruit fly	Spotted wing drosophila†	Mites	Pear psylla	Codling moth	Registered for use on:					
														Apricots	Cherries	Peaches	Nectarines	Plums	Pears
18	Intrepid	NT	3 * 1 st gen	0	0	3 *	0	0	0	0	0	0	1	✓	✓	✓	✓	✓	✓
20B	Kanemite 15 SC	NT	0	0	0	0	0	0	0	0	4 *	0	0	NR	NR	NR	NR	NR	✓
15	Rimon 10 EC	MT ²	4 *	0	4	4 *	0	0	0	1	0	—	—	✓	✓	✓	✓	✓	NR
21	Nexter	HT	0	0	0	0	0	0	0	0	3–4 *	2 *	0	NR	✓	✓	✓	NR	✓
23	Envirdor 240 SC	MT	0	0	0	0	0	0	0	0	4 *	0	0	✓	✓	✓	✓	✓	✓
23	Movento 240 SC	HT ²	0	0	0	0	0	4 *	0	1	0	4 *	0	✓	✓	✓	✓	✓	✓
28	Altacor	NT	4 *	1	1	4 *	1 *	0	0 *	0	0	0	4 *	✓	✓	✓	✓	✓	✓
28	Exirel	HT	4 *	4 *	3	4 *	3 *	3 *	3 *	4	0	—	3 *	✓	✓	✓	✓	✓	✓
29	Beleaf 50 SG	NT	0	0	2	0	0	3 *	0	0	0	0	0	✓	✓	✓	✓	✓	✓
NC	Purespray Green Spray Oil 13 E	—	0	0	0	0	0	2 *	0	0	4 *	2 *	0	✓	✓	✓	✓	✓	✓
NC	Superior 70 Oil	—	0	0	0	0	0	0	0	0	4 *	2 *	0	✓	✓	✓	✓	✓	✓
NC	Surround WP	I ³	1 *	2 *	2 *	2 * ow	1	0	—	1	0	2 *	1 * 1 st gen	NR	NR	NR	NR	NR	✓
NC	Vegol Crop Oil	—	0	0	0	0	0	2 *	0	0	3 *	2 *	0	✓	✓	✓	✓	✓	✓
NC	Isomate OFM TT	—	MD *	0	0	0	0	0	0	0	0	0	0	✓	✓	✓	✓	✓	✓
NC	Isomate CM/OFM TT	—	MD *	0	0	0	0	0	0	0	0	0	MD *	✓	✓	✓	✓	✓	✓

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MT = Moderately toxic to bees. Can be used around bees if dosage, timing and method of application are correct, but do not apply them directly on bees, in the field or at the colonies.

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¹ Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

² May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

0 = Not effective. 1 = Slightly effective/suppression. 2 = Fair. 3 = Good. 4 = Very good. NA = Not used at this timing for this pest. MD = Mating disruption.

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ow = Overwintering generation. * (shaded area) = Pest is listed on the product label for control or suppression. † = Product efficacy may be reduced due to long preharvest intervals.

✓ = Registered on the crop, but not necessarily for all insects. NR = Not registered for use on this crop. t = Tart cherry only.

Source: Various U.S. extension publications, scientific journal articles, Canadian Pest Management Research Reports, Plant Disease Management Reports (APS), Arthropod Management Reports (ESA).

Adjuvants Used in Fruit Crops

Spray adjuvants are tank-mix additives used to modify and enhance the effectiveness of the pesticide. They include surfactants, spreader/stickers, crop oils, anti-foaming agents, buffering agents, etc. Unless the product label specifies an adjuvant be added to the tank, growers do not need to use them.

A label may specify a particular name brand, or generalize a category of adjuvant. In the latter case, the grower is free to use any adjuvant in that category, provided it is registered for use on the crop. Always use adjuvants as directed on the product label. See Table 5–9. *Adjuvants Used in Ontario*, on this page, for common adjuvants used in fruit crops.

Table 5–9. Adjuvants Used in Ontario

Some pesticides used together or in close succession to crop oils or other adjuvants can cause crop injury. Do not use Supra Captan, Maestro, Folpan, Bravo, Echo or sulphur-based products with crop oils or adjuvants which are used to increase pesticide uptake. Crop safety issues can also occur around some formulations of copper or specific products, such as Group 11 fungicides. Read product labels closely for additional precautions around product compatibility with surfactants or crop oils. For more information on adjuvants, see sprayers101.com or Purdue Extension, *Adjuvants and the Power of the Spray* at ppp.purdue.edu/wp-content/uploads/2016/08/PPP-107.pdf.

Trade Name	Registration Number	Adjuvant Type	Characteristics
Agral 90	11809 24725	non-ionic surfactant	• wetter-spreader • compatible with most pesticides¹ • helps pesticide penetrate plant cuticle
Ipco Ag-Surf	15881	non-ionic surfactant	• wetter-spreader • compatible with most pesticides¹ • helps pesticide penetrate plant cuticle
LI 700	23026	non-ionic surfactant	• wetter-spreader • compatible with most pesticides¹ • helps pesticide penetrate plant cuticle • additional properties: pH adjuster, sticker
Purespray Green Spray Oil 13 E	27666	crop oil (mineral)	• helps pesticide penetrate plant cuticle or insect exoskeleton
Xiameter OFX-0309	23078	silicone surfactant (organosilicone)	• wetter-spreader • helps pesticide penetrate plant cuticle • reduces surface tension • improves rainfastness

¹ Check product label for precautions around surfactant compatibility before using.

WALNUT CALENDAR

In this section:

- Read the product label and follow all safety precautions. 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>.
- For preharvest interval, restricted entry interval, and maximum applications, see Table 6–1. *Products Used on Tree Nuts*, page 378.
- **Products are listed by chemical group and in alphabetical order within each group. The order does not reflect efficacy.** See Table 6–2. *Activity of Insecticides and Miticides on Walnut Pests*, page 381, for efficacy ratings.
- Where a product in the calendar is followed by a “*”, it is potentially acceptable for organic use based on *Ministère de l’Agriculture, des Pêcheries et de l’Alimentation du Québec publication Bulletin D’Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with your certifying body to verify the acceptability of any product prior to using it.

Resistance Management

To delay development of resistance to insecticides, miticides and fungicides, follow resistance management guidelines outlined in *Resistance Management Strategies*, page 393. The chemical group is indicated in the column labelled “Group” before the “Product” column. Products belonging to the same chemical group are grouped together in the calendar. Multi-site (M) fungicides are not prone to resistance and do not have to be rotated. Some products are not classified to mode of action (NC) and the mode of action has not been determined for others (U or UN).

Fungicide resistance management

Take the following steps to avoid rapid development of fungicide resistance:

- Do not reduce rates below those specified on the label.
- Do not use products containing the same chemical group in consecutive applications.

Insecticide resistance management

Take the following steps to avoid development of insecticide resistance:

- For pests with discrete generations (leafroller, codling moth), do not use insecticides from the same group for more than one generation. Within a generation, if more than one spray is required, use a product from the same chemical group.
- For pests with overlapping generations (aphids, mites), do not use products containing the same chemical group in consecutive applications.

Spray Water Volumes

Thorough coverage of all affected plant surfaces is essential for maximum efficacy of many tree nut products. Sufficient water volumes are necessary to provide complete coverage with insecticides, miticides and fungicides. Consult the product label for suggested water volumes. Otherwise, use enough water to ensure thorough spray coverage. Where the product rate is listed in amount per 1,000 L, or if a water volume is not provided on the label, use enough water to wet the foliage to the near drip point.

Bee Toxicity

Some insecticides are toxic to bees and other pollinating insects. Use of insecticides on flowering crops requires careful management to avoid negative effects on pollinators. Some insecticides cannot be applied prior to or during bloom. Use extreme caution when applying insecticides to tree nuts during bloom—do not apply them while bees are active in the orchard. Before and after bloom, bees may still be present on flowering cover crops and weeds—do not allow drift of insecticides onto these or other flowering crops. Always follow label precautions regarding avoiding impacts on bees. For more information, see *Bee Poisoning*, page 5, and honeybee toxicity ratings in Table 6–6. *Toxicity of Pesticides to Honeybees and Mite/Aphid Predators*, page 384.

Buffer Zones

Leave a suitable buffer zone between treatment area and adjacent sensitive areas, such as hedgerows, woodlots and freshwater habitats. Zones may vary depending on the product used, growth stage of the crop and method of application including the use of drift-reducing technology. Check the pesticide label for requirements.

Use Health Canada's online spray drift calculator to modify the buffer zone specified on the label based on weather conditions, category of spray equipment and 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. Unfortunately, this model does not account for carrier volume, travel speed or crop stage.

Observing buffer zones is a legal requirement. A record of the buffer zone modification, if any, must be retained for at least one year from the time of application.

Crop Nutrition

Crop nutrition is important for plant growth, fruit quality development and the acquisition of adequate cold hardiness by tree fruit. For fruit crops, soil testing, plant tissue analysis and visual deficiency symptoms all play an important role in assessing and monitoring the crop's nutritional status. For more information, visit <http://www.omafra.gov.on.ca/english/crops/hort/agrofore.html> (click on *Soil Management, Fertilizer Use, Crop Nutrition and Cover Crops for Fruit Production*) and see OMAFRA Publication 611, *Soil Fertility Handbook*. For soil testing and plant tissue analysis services, see Appendix E: *Accredited Soil-Testing Laboratories in Ontario*, page 435.

Disease or Insect Group	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Prebloom						
Leafrollers	General Comments: • Leafrollers are generally not a problem on walnut and will not often require control. • If needed, apply when larvae have emerged and before they roll up in the leaves. Reapply in 1–2 weeks, if needed. • Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.					
	3	Matador 120 EC	83 mL/ha	24 hours	14 days	This group is highly toxic to beneficial insects and may lead to mite outbreaks. Maximum of 1 application per season.
	5	Delegate	210–420 g/ha	12 hours	14 days	Use higher rate under high pest pressure or for larger larvae. Reapply in 14 days if needed.
		Entrust *	364 mL/ha	when dry	14 days	Reapply in 7–10 days if needed.

— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease or Insect Group	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Prebloom						
Leafrollers (cont'd)	11	Bioprotec CAF * or Dipel 2X DF *	2.8–4.0 L/ha 1.12 kg/ha	12 hours	0 days	Product must be consumed to be effective. Spray when and where pests are actively feeding. Apply in a high-volume spray to ensure thorough coverage on both sides of the leaf. Apply to young larvae, early in infestation. Death of insect may take several days. Products have short residual activity—repeat applications may be required. Use diluted spray mixture within 12 hours. For Dipel, use 1.6 kg/ha for large or mature trees.
	18	Intrepid	750 mL/ha	12 hours	14 days	For overwintering generations of obliquebanded leafroller, apply when larvae become active in the spring.
	28	Altacor	145–285 g/ha	12 hours	10 days	For overwintering generations of obliquebanded leafroller, apply when larvae become active in the spring. Tank-mixing or sequential applications of Exirel with certain fungicides (e.g., copper), oils or other products may cause crop injury. See product label for other tank-mix restrictions.
		Exirel	0.5–1.0 L/ha	12 hours	5 days	
	NC	Surround WP *	50 kg/ha	12 hours	1 day	Reduction in damage only. Apply at first egg hatch. Make a second application 10 days later. Repeat at 7–14-day intervals as subsequent generations emerge. Efficacy depends on complete coverage of leaves and fruit. Light rain will help distribute product. Reapply after heavy rain, wind, overhead irrigation or new growth. Creates a white film on plant parts. Stop application once nuts are sizing. Do not use with anti-foaming agents, spreader/stickers or summer oils.
Codling moth	General Comments: - Codling moth is a sporadic problem in commercial walnuts. Control may not be required. - If control is required, pheromone traps for adult flights and degree-day models for this pest in apples can be used to determine optimal spray timing. For information on calculating degree-days, see Appendix B: <i>Degree-Day Modeling</i>, page 428. - Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.					
	3	Matador 120 EC	83 mL/ha	24 hours	14 days	This group is highly toxic to beneficial insects and may lead to mite outbreaks. Maximum of 1 application per season.
	5	Delegate	420 g/ha	12 hours	14 days	Apply at first egg hatch, before larvae penetrate nuts. Reapply in 14 days if needed.
		Entrust *	364 mL/ha	when dry	14 days	Suppression only. Apply at first egg hatch, before larvae penetrate nuts. Reapply in 7–10 days if needed.
	28	Altacor	145–215 g/ha	12 hours	10 days	Apply before first egg hatch. Reapply 10–14 days later if needed. Under high pest pressure, use high rate. Tank-mixing or sequential applications of Exirel with certain fungicides (e.g., copper), oils or other products may cause crop injury. See product label for other tank-mix restrictions.
		Exirel	500–750 mL/ha	12 hours	5 days	

— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease or Insect Group	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Prebloom						
Codling moth (cont'd)	NC	Isomate-CM/OFM TT *	750 dispensers/ha	—	—	Reduces mating of codling moth and oriental fruit moth. Place dispensers in upper third of canopy, before first codling moth flight in the spring. Dispensers last up to 150 days for codling moth and up to 90 days for oriental fruit moth. If populations of codling are very high, additional control measures may be required. For more information on mating disruption, see OMAFRA Factsheet 03–079, <i>Mating Disruption for Management of Insect Pests</i> .
Aphids	General Comments: - Aphids on walnut are generally controlled by natural enemies. When controlling other pests, select products with minimal impacts on beneficial insects. - If control is required, apply in early stages of aphid infestation for best results. - Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.					
	3	Matador 120 EC	104 mL/ha	24 hours	14 days	This group is highly toxic to beneficial insects and may lead to mite outbreaks. Maximum of 1 application per season. Do not apply when bees are active.
	4C	Closer	100–200 mL/ha	12 hours	7 days	Where possible, rotate with products outside of Group 4. Toxic to certain beneficial insects.
	4D	Sivanto Prime	500–750 mL/ha	7 days	12 hours	Where possible, rotate with products outside of Group 4. Toxic to certain beneficial insects.
	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	Begin applications when populations are low and reapply every 1–3 weeks as needed. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. These products must coat the bodies of susceptible, soft-bodied insects to be effective. Good coverage of all sides of plant parts is critical. Applying soaps more than 3 times may cause plant injury. See label for more information. Avoid application in direct sunlight. Use caution when applying to new seedlings or blooms. Do not apply when plants are under stress. Application within 3 days of sulphur may increase plant injury on sensitive plants (note: sulphur products are not currently registered on tree nuts).
		Vegol Crop Oil *	2% v/v in 700– 1,900 L water/ha	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. Do not use within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed trees. Do not apply to wet foliage. Do not use within 14 days of copper or 30 days of sulphur (note: no sulphur products are currently registered on tree nuts). Avoid application during bloom.

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Disease or Insect Group	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Prebloom						
Scale	General Comments: - Monitor scaffold branches and apply when crawlers are active. - Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.					
	4C	Closer	200–400 mL/ha	12 hours	7 days	San Jose scale only. Toxic to certain beneficial insects.
	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	Soft brown scale only. Begin applications when populations are low and reapply every 1–3 weeks as needed. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. These products must coat the bodies of susceptible, soft-bodied insects to be effective. Good coverage of all sides of plant parts is critical. Applying soaps more than 3 times may cause plant injury. See label for more information. Avoid application in direct sunlight. Use caution when applying to new seedlings or blooms. Do not apply when plants are under stress. Application within 3 days of sulphur may increase plant injury on sensitive plants (sulphur products are not currently registered on tree nuts).
		Vegol Crop Oil *	2% v/v in 700– 1,900 L water/ha	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. Do not apply within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of copper or 30 days of sulphur (note: no sulphur products are currently registered on tree nuts). Do not apply to wet foliage. Avoid application during bloom.
Spider mites	General Comments: - Two-spotted spider mite and European red mite are rarely an economically significant problem on commercial walnut in Ontario. - If required, apply when mites are active on foliage. Thorough spray coverage is essential for good control.					
	20	Kanemite 15 SC	2.07 L/ha	12 hours	14 days	For resistance management, make only 1 application per season.
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.						

Disease or Insect Group	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Prebloom						
Spider mites (cont'd)	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	Begin applications when populations are low and reapply every 1–3 weeks as needed. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. These products must coat the bodies of susceptible, soft-bodied insects to be effective. Good coverage of all sides of plant parts is critical. Applying soaps more than 3 times may cause plant injury. See label for more information. Avoid application in direct sunlight. Use caution when applying to new seedlings or blooms. Do not apply when plants are under stress. Application within 3 days of sulphur may increase plant injury on sensitive plants (sulphur products are not currently registered on tree nuts).
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. Do not apply within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of copper or 30 days of sulphur (note: no sulphur products are currently registered on tree nuts). Do not apply to wet foliage. Avoid application during bloom.
	UN	Acramite 50 WS	568 g/ha	12 hours	14 days	Rate controls two-spotted spider mite. If European red mite is present, apply 851 g/ha. Maximum of 1 application per season.
Dogwood borer	NC	Isomate DWB	250–375 dispensers/ha	—	—	Dogwood borer is not commonly a pest of tree nuts. Apply where there is a history of infestation. Reduces mating of dogwood borer. Apply before adult borer emergence (end of May). Use high rate for high pressure areas or initial year of treatment. For more information on mating disruption, see OMAFRA Factsheet 03–079, <i>Mating Disruption for Management of Insect Pests</i> .

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Disease or Insect Group	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Prebloom						
Walnut blight	General Comments: - Walnut blight is predominantly a problem of Persian (English) walnuts. - Apply preventative sprays to protect developing buds and nuts in spring or during periods of prolonged leaf wetness. Repeat, as needed, at 7–10-day intervals. - Note that in other growing regions, resistance of the walnut blight pathogen to copper has become a problem. Use copper only when necessary and rotate with products from other groups, - Thorough coverage is essential to protect susceptible green tissue.					
	M	Copper Spray *	4 kg/1,000 L water	48 hours	40 days	Apply at first pistillate or late May and repeat monthly if needed. Apply in a high-volume spray to ensure thorough coverage. Do not use in combination with or closely following Vegol or Exirel. See product labels for details. When mixed with lime, this product cannot be mixed with insecticide wettable powders.
		Cueva	1% v/v in 470–940 L water/ha	4 hours	1 day	May cause leaf spots during excessive moisture and cold. If concerned about sensitivity of plants, apply first to small areas. Do not use in combination with or closely following Vegol or Exirel. See product labels for details.
	24	Kasumin 2L	5 L/ha	12 hours	100 days	Apply when conditions favour disease development.
First pistillate flower						
INSECTICIDES MAY BE TOXIC TO BEES. DO NOT SPRAY WHEN BEES ARE WORKING. SPRAY IN THE EVENING. SEE BEE POISONING, PAGE 5.						
Aphids	General Comments: - Aphids on walnut are generally controlled by natural enemies. When controlling other pests, select products with minimal impacts on beneficial insects. - If control is required, apply in early stages of aphid infestation for best results. - Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.					
	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	See comments for these products under Aphids in Prebloom .
Scale	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	See comments for these products under Scale in Prebloom .
Butternut curculio	NC	Surround WP *	50 kg/ha	12 hours	1 day	Reduction in damage only. Apply when visual inspection shows adult feeding and egg-laying scars on new flower shoots. Repeat at 7-day intervals as needed to keep nuts covered throughout egg-laying period. Efficacy depends on complete coverage of leaves and fruit. Light rain will help distribute product. Reapply after heavy rain, wind, overhead irrigation or new growth. Creates a white film on plant parts. Stop application once nuts are sizing. Do not use with anti-foaming agents, spreader/stickers or summer oils.
Walnut blight	Use one of the products listed for Walnut blight at Prebloom .					
— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.						

Disease or Insect Group	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Summer sprays						
Leafroller	General Comments: - Leafrollers are generally not a problem on walnut and will not often require control. - If control is required, pheromone traps for adult flights and degree-day models for this pest in apples can be used to determine optimal spray timing. For information on calculating degree-days, see Appendix B: <i>Degree-Day Modeling</i>, page 428. - Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.					
	3	Matador 120 EC	83 mL/ha	24 hours	14 days	This group is highly toxic to beneficial insects and may lead to mite outbreaks. Maximum of 1 application per season.
	5	Delegate	210–420 g/ha	12 hours	14 days	Apply at first egg hatch.
		Entrust *	364 mL/ha	when dry	14 days	
	11	Bioprotec CAF * or Dipel 2X DF *	2.8–4.0 L/ha 1.12 kg/ha	12 hours	0 days	See comments for these products under Leafrollers in Prebloom .
	18	Intrepid	750 mL/ha	12 hours	14 days	Apply at first egg hatch. Reapply 10–14 days later if needed
	28	Altacor	145–285 g/ha	12 hours	10 days	Apply at first egg hatch. Reapply 10 days later if needed. Tank-mixing or sequential applications of Exirel with certain fungicides (e.g., copper), oils or other products may cause crop injury. See product label for other tank-mix restrictions.
		Exirel	0.5–1.0 L/ha	12 hours	5 days	
	NC	Surround WP *	50 kg/ha	12 hours	1 day	Reduction in damage only. See comments for this product under Leafrollers in Prebloom .
Codling moth	General Comments: - Codling moth is a sporadic problem in commercial walnuts. Control may not always be required. - If control is required, pheromone traps for adult flights and degree-day models for this pest in apples can be used to determine optimal spray timing. For information on calculating degree-days, see Appendix B: <i>Degree-Day Modeling</i>, page 428. - Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.					
	3	Matador 120 EC	83 mL/ha	24 hours	14 days	This group is highly toxic to beneficial insects and may lead to mite outbreaks. Maximum of 1 application per season.
	5	Delegate	420 g/ha	12 hours	14 days	Apply at first egg hatch, before larvae penetrate nuts. Reapply in 14 days if needed.
		Entrust *	364 mL/ha	when dry	14 days	Suppression only. Apply at first egg hatch, before larvae penetrate nuts. Reapply in 7–10 days if needed.
	18	Intrepid	1.0 L/ha	12 hours	14 days	Suppression only. Apply at first egg hatch and repeat in 10–14 days if needed.
	28	Altacor	145–215 g/ha	12 hours	10 days	Apply at first egg hatch. Use high rate under high pressure. Reapply 10–14 days later if needed. Tank-mixing or sequential applications of Exirel with certain fungicides (e.g., copper), oils or other products may cause crop injury. See product label for other tank-mix restrictions. No product specific comments.
		Exirel	500–750 mL/ha	12 hours	5 days	

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Disease or Insect Group	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Summer sprays						
Aphids	General Comments: - Aphids on walnut are generally controlled by natural enemies. When controlling other pests, select products with minimal impacts on beneficial insects. - If control is required, apply in early stages of aphid infestation for best results. - Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.					
	3	Matador 120 EC	104 mL/ha	24 hours	14 days	This group is highly toxic to beneficial insects and may lead to mite outbreaks. Maximum of 1 application per season.
	4A	Admire 240 Flowable	230 mL/ha	24 hours	7 days	Use postbloom only. Maximum 2 applications of Group 4A insecticides per season. Repeated use may cause mite outbreaks.
	4C	Closer	100–200 mL/ha	12 hours	7 days	Where possible, rotate with insecticides outside of Group 4. Toxic to certain beneficial insects.
	4D	Sivanto Prime	500–750 mL/ha	7 days	12 hours	Where possible, rotate with insecticides outside of Group 4. Toxic to certain beneficial insects.
	23	Movento 240 SC	365 mL/ha	12 hours	7 days	Use postbloom only. Control may not be apparent for 2–3 weeks. Under high pest pressure, reapply 2 weeks later. Tank-mix with an adjuvant/additive that has spreading and penetrating properties at a suggested rate of 0.2% v/v. See label and Table 6–7. <i>Adjuvants Used in Ontario</i> , page 386, for further details. Do not tank-mix with sulphur (note: sulphur products are not currently registered on tree nuts).
	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	See comments for these products under Aphids in Prebloom .
		Vegol Crop Oil *	2% v/v in 700– 1,900 L water/ha	12 hours	0 days	See comments for this product under Aphids in Prebloom .
Scale	General Comments: - Monitor scaffold branches and apply when crawlers are active. - Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.					
	4C	Closer	200–400 mL/ha	12 hours	7 days	San Jose scale only. Where possible, rotate with insecticides outside of Group 4 between generations. Toxic to certain beneficial insects.
	23	Movento 240 SC	585 mL/ha	12 hours	7 days	Control of San Jose scale and suppression of Lecanium scale. Use postbloom only. Control may not be apparent for 2–3 weeks. Under high pest pressure, reapply 2 weeks later. Tank-mix with an adjuvant/additive that has spreading and penetrating properties at a suggested rate of 0.2% v/v. See label and Table 6–7. <i>Adjuvants Used in Ontario</i> , page 386, for further details. Do not tank-mix with sulphur.

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Disease or Insect Group	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Summer sprays						
Scale (cont'd)	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	Soft brown scale only. See comments for these products under Scale in Prebloom .
		Vegol Crop Oil *	2% v/v in 700– 1,900 L water/ha	12 hours	0 days	See comments for this product under Scale in Prebloom .
Spider mites	General Comments: - Two-spotted spider mite and European red mite are rarely an economically significant problem on commercial walnut in Ontario. - If required, apply when mites are active on foliage. Thorough spray coverage is essential for good control.					
	20	Kanemite 15 SC	2.07 L/ha	12 hours	14 days	For resistance management, maximum of 1 application per season.
	23	Envidor 240 SC	750 mL/ha	12 hours	7 days	Use postbloom only. Maximum of 1 application per season. Do not use in orchards inter-planted with other crops.
	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	See comments for these products under Spider mites in Prebloom .
		Vegol Crop Oil *	2% v/v in 700– 1,900 L water/ha	12 hours	0 days	See comments for this product under Spider mites in Prebloom .
	UN	Acramite 50 WS	568 g/ha	12 hours	14 days	Rate controls two-spotted spider mite. If European red mite is present, apply 851 g/ha. Maximum of 1 application per season.
Leafhopper	General Comments: - Leafhoppers are a sporadic problem on walnuts. - Control may be required with heavy infestations, particularly on young trees. Monitor for leafhopper activity beginning in late spring.					
	4A	Admire 240 Flowable	200 mL/ha	24 hours	7 days	Suppression only. Use postbloom only.
Butternut curculio	General Comments: - Butternut curculio is an economically significant pest of black and English (Persian) walnut. - Begin monitoring for curculio activity in early spring, when shoot growth begins. - Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.					
	3	Matador 120 EC	104 mL/ha	24 hours	14 days	Apply when visual inspection shows adult feeding or egg-laying scars in new flower shoots. This group is highly toxic to beneficial insects and may lead to mite outbreaks. Maximum of 1 application per season.
	5	Delegate	420 g/ha	12 hours	14 days	Suppression only. Apply at first sign of feeding damage after bloom. Reapply 14 days later depending on pest pressure.
	NC	Surround WP *	50 kg/ha	12 hours	1 day	See comments for this product under Butternut Curculio in First Pistillate Flower .

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Disease or Insect Group	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Summer sprays						
Husk maggot	General Comments: - Husk maggot will attack husks of English and black walnut but are a more significant problem on English (Persian) walnut. - Use sticky traps to monitor for adult flies prior to egg laying typically August to mid-September. - Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.					
	3	Matador 120 EC	104 mL/ha	24 hours	14 days	Apply when sticky traps show adult activity. This group is highly toxic to beneficial insects and may lead to mite outbreaks. Maximum of 1 application per season.
	5	Delegate	420 g/ha	12 hours	14 days	Suppression only. Apply 7–10 days after first fly is caught on sticky traps. Reapply 14 days later depending on pest pressure.
		GF-120 Fruit Fly Bait *	1.5 L/6 L water	when dry	0 days	Under high pest pressure, this product may provide suppression only. Apply when first fly is caught on sticky traps. Reapply every 7 days or sooner if rain washes off residue. Large droplet sizes optimize the attractiveness of the bait. Proper application techniques help ensure adequate coverage. Apply using an all-terrain vehicle fitted with an appropriate sprayer and nozzle for a large spray droplet size of 4–6 mm directed to underside of leaves and inside the canopy.
	NC	Surround WP *	50 kg/ha	12 hours	1 day	Reduction in damage only. Apply when sticky traps show adult activity. Repeat at 7-day intervals as needed to maintain good coverage. Efficacy depends on complete coverage of leaves and fruit. Light rain will help distribute product. Reapply after heavy rain, wind, overhead irrigation or new growth. Creates a white film on plant parts. Stop application once nuts are sizing. Do not use with anti-foaming agents, spreader/stickers or summer oils.
Walnut blight	If necessary, use one of the products listed for Walnut blight at Prebloom . See Table 6–1. <i>Products Used on Tree Nuts</i> , page 378, for preharvest intervals. Walnut blight controls should predominantly be targeted at protecting developing buds and nuts in the spring. Last Copper Spray application should be no later than husk split.					
Botrytis grey mould	7	Fontelis	1.0–1.5 L/ha	12 hours	14 days	Botrytis is not a common problem on tree nuts. Apply only if there has been a history of disease. Begin application prior to disease development and repeat in 7–14 days if needed. Will also provide control of brown rot (<i>Monilinia</i> spp.) and suppression of Alternaria leaf spot. Contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., sulphur) may cause crop safety issues. See label for tank-mix restrictions.

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PECAN AND SWEET CHESTNUT CALENDAR

In this section:

- Read the product label and follow all safety precautions. 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>.
- For preharvest interval, restricted entry interval, and maximum applications, see Table 6–1. *Products Used on Tree Nuts*, page 378.
- **Products are listed by chemical group and in alphabetical order within each group. The order does not reflect efficacy.** See Table 6–3. *Activity of Insecticides and Miticides on Chestnut and Pecan Pests*, page 382, for efficacy ratings.
- Where a product in the calendar is followed by a “*”, it is potentially acceptable for organic use based on *Ministère de l’Agriculture, des Pêcheries et de l’Alimentation du Québec publication Bulletin D’Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with your certifying body to verify the acceptability of any product prior to using it.

Resistance Management

To delay development of resistance to insecticides, miticides and fungicides, follow resistance management guidelines outlined in *Resistance Management Strategies*, page 393. The chemical group is indicated in the column labelled “Group” before the “Product” column. Products belonging to the same chemical group are grouped together in the calendar. Multi-site (M) fungicides are not prone to resistance and do not have to be rotated. Some products are not classified to mode of action (NC) and the mode of action has not been determined for others (U or UN).

Fungicide resistance management

Take the following steps to avoid rapid development of fungicide resistance:

- Do not reduce rates below those specified on the label.
- Do not use products containing the same chemical group in consecutive applications.

Insecticide resistance management

Take the following steps to avoid development of insecticide resistance:

- For pests with discrete generations (leafrollers), do not use insecticides from the same group for more than one generation. Within a generation, if more than one spray is required, use a product from the same chemical group.
- For pests with overlapping generations (aphids, mites), do not use products containing the same chemical group in consecutive applications.

Spray Water Volumes

Thorough coverage of all affected plant surfaces is essential for maximum efficacy of many tree nut products. Sufficient water volumes are necessary to provide complete coverage with insecticides, miticides and fungicides. Consult the product label for suggested water volumes. Otherwise, use enough water to ensure thorough spray coverage. Where the product rate is listed in amount per 1,000 L, or if a water volume is not provided on the label, use enough water to wet the foliage to the near drip point.

Bee Toxicity

Some insecticides are toxic to bees and other pollinating insects. Use of insecticides on flowering crops requires careful management to avoid negative effects on pollinators. Some insecticides cannot be applied prior to or during bloom. Use extreme caution when applying insecticides to tree nuts during bloom—do not apply them while bees are active in the orchard. Before and after bloom, bees may still be present on flowering cover crops and weeds—do not allow drift of insecticides onto these or other flowering crops. Always follow label precautions regarding avoiding impacts on bees. For more information, see *Bee Poisoning*, page 5, and honeybee toxicity ratings in Table 6–6. *Toxicity of Pesticides to Honeybees and Mite/Aphid Predators*, page 384.

Buffer Zones

Leave a suitable buffer zone between treatment area and adjacent sensitive areas, such as hedgerows, woodlots and freshwater habitats. Zones may vary depending on the product used, growth stage of the crop and method of application including the use of drift-reducing technology. Check the pesticide label for requirements.

Use Health Canada's online spray drift calculator to modify the buffer zone specified on the label based on weather conditions, category of spray equipment and 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. Unfortunately, this model does not account for carrier volume, travel speed or crop stage.

Observing buffer zones is a legal requirement. A record of the buffer zone modification, if any, must be retained for at least one year from the time of application.

Crop Nutrition

Crop nutrition is important for plant growth, fruit quality development and the acquisition of adequate cold hardiness by tree fruit. For fruit crops, soil testing, plant tissue analysis and visual deficiency symptoms all play an important role in assessing and monitoring the crop's nutritional status. For more information, visit <http://www.omafr.gov.on.ca/english/crops/hort/agrofore.html> (click on *Soil Management, Fertilizer Use, Crop Nutrition and Cover Crops for Fruit Production*) and see OMAFRA Publication 611, *Soil Fertility Handbook*. For soil testing and plant tissue analysis services, see Appendix E: *Accredited Soil-Testing Laboratories in Ontario*, page 435.

Disease or Insect Group	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Prebloom						
Leafrollers	General Comments: • Leafrollers are generally not a problem on chestnut or pecan and will not often require control. • If needed, apply when larvae have emerged and before they roll up in the leaves. Reapply in 1–2 weeks, if needed. • Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.					
	3	Matador 120 EC	83 mL/ha	24 hours	14 days	Chestnut only. This group is highly toxic to beneficial insects and may lead to mite outbreaks. Maximum of 1 application per season.
	5	Delegate	210–420 g/ha	12 hours	14 days	Use higher rate under high pest pressure or for larger larvae. Reapply in 14 days if needed.
	11	Bioprotec CAF * or Dipel 2X DF *	2.8–4.0 L/ha 1.12 kg/ha	12 hours	0 days	Product must be consumed to be effective. Spray when and where pests are actively feeding. Apply in a high-volume spray to ensure thorough coverage on both sides of the leaf. Apply to young larvae, early in infestation. Death of insect may take several days. Products have short residual activity and repeat applications may be required. Use dilute spray mixture within 12 hours. For Dipel, use 1.6 kg/ha for large or mature trees.

— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

Disease or Insect Group	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Prebloom						
Leafrollers (cont'd)	18	Intrepid	750 mL/ha	12 hours	14 days	Apply when larvae become active in the spring.
	28	Altacor	145–285 g/ha	12 hours	10 days	Tank-mixing or sequential applications of Exirel with certain fungicides (e.g., copper), oils or other products may cause crop injury. See product label for other tank-mix restrictions.
		Exirel	0.5–1.0 L/ha	12 hours	5 days	
Aphids	General Comments: • Aphids on chestnut and pecan are generally controlled by natural enemies. When controlling other pests, select products with minimal impacts on beneficial insects. • Begin monitoring in mid-spring for young nymphs. If control is required, apply in early stages of aphid infestation for best results. • Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.					
	3	Matador 120 EC	104 mL/ha	24 hours	14 days	Chestnut only. This group is highly toxic to beneficial insects and may lead to mite outbreaks. Maximum of 1 application per season.
	4C	Closer	100–200 mL/ha	12 hours	7 days	Where possible, rotate with insecticides outside of Group 4. Toxic to certain beneficial insects.
	4D	Sivanto Prime	500–750 mL/ha	7 days	12 hours	Where possible, rotate with insecticides outside of Group 4. Toxic to certain beneficial insects.
	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	Begin applications when populations are low and reapply every 1–3 weeks as needed. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. These products must coat the bodies of susceptible, soft-bodied insects to be effective. Good coverage of all sides of plant parts is critical. Applying soaps more than 3 times may cause plant injury. See label for more information. Avoid application in direct sunlight. Use caution when applying to new seedlings or blooms. Do not apply when plants are under stress. Application within 3 days of sulphur may increase plant injury on sensitive plants (note: sulphur products are not currently registered on tree nuts).
		Vegol Crop Oil *	2% v/v in 700– 1,900 L water/ha	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. Do not apply within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of copper or 30 days of sulphur (note: no sulphur products are currently registered on tree nuts). Do not apply to wet foliage. Avoid application during bloom.

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Disease or Insect Group	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Prebloom						
Leafhoppers	General Comments: • Leafhopper damage to chestnut leaves and shoots can be significant in some years, particularly on younger trees. • Monitor for leafhoppers weekly beginning in mid-late spring so populations can be detected early and controls applied prior to significant leaf damage.					
	NC	Surround WP *	50 kg/ha	12 hours	1 day	Sweet chestnut only. Reduction in damage only. Begin applications at initial infestation, as determined by monitoring. Repeat at 7–14-day intervals as needed. Efficacy depends on complete coverage of leaves and fruit. Light rain will help distribute product. Reapply after heavy rain, wind, overhead irrigation or new growth. Creates a white film on plant parts. Stop application once nuts are sizing. Do not use with anti-foaming agents, spreader/stickers or summer oils.
Scale	General Comments: • Scale is rarely a problem in chestnuts or pecans. • Monitor scaffold branches and apply when crawlers are active. • Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.					
	4C	Closer	200–400 mL/ha	12 hours	7 days	San Jose scale only. Where possible, rotate with insecticides outside of Group 4 between generations. Toxic to certain beneficial insects.
	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	Begin applications when populations are low and reapply every 1–3 weeks as needed. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. These products must coat the bodies of susceptible, soft-bodied insects to be effective. Good coverage of all sides of plant parts is critical. Applying soaps more than 3 times may cause plant injury. See label for more information. Avoid application in direct sunlight. Use caution when applying to new seedlings or blooms. Do not apply when plants are under stress. Application within 3 days of sulphur may increase plant injury on sensitive plants (note: sulphur products are not currently registered on tree nuts).
		Vegol Crop Oil *	2% v/v in 700– 1,900 L water/ha	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. Do not apply within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of copper or 30 days of sulphur (note: no sulphur products are currently registered on tree nuts). Do not apply to wet foliage. Avoid application during bloom.

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Disease or Insect Group	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Prebloom						
Mites	General Comments: - Both two-spotted spider mite and European red mite will feed on chestnut. However, plants can tolerate some damage without significantly affecting yield or crop health. - Control may not always be required, particularly when populations of predatory mites are high. If required, apply when mites are active on foliage.					
	20	Kanemite 15 SC	2.07 L/ha	12 hours	14 days	For resistance management, maximum of 1 application per season.
	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	Begin applications when populations are low and reapply every 1–3 weeks as needed. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. These products must coat the bodies of susceptible, soft-bodied insects to be effective. Good coverage of all sides of plant parts is critical. Applying soaps more than 3 times may cause plant injury. See label for more information. Avoid application in direct sunlight. Use caution when applying to new seedlings or blooms. Do not apply when plants are under stress. Application within 3 days of sulphur may increase plant injury on sensitive plants (note: sulphur products are not currently registered on tree nuts).
		Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	Chestnut only. Suppression only. Apply in a high-volume spray to ensure thorough coverage. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. Do not apply within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of using sulphur (note: no sulphur products are currently registered on tree nuts). See label for compatibility with other products.
		Vegol Crop Oil *	2% v/v in 700– 1,900 L water/ha	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. Do not apply within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of copper or 30 days of sulphur (note: no sulphur products are currently registered on tree nuts). Do not apply to wet foliage. Avoid application during bloom.
	UN	Acramite 50 WS	568 g/ha	12 hours	14 days	Rate controls two-spotted spider mite. If European red mite is present, apply 851 g/ha. Maximum of 1 application per season.
Dogwood borer	NC	Isomate DWB	250–375 dispensers/ha	—	—	Dogwood borer is not commonly a pest of tree nuts. Apply where there is a history of infestation. Reduces mating of dogwood borer. Apply before adult borer emergence (end of May). Use high rate for high-pressure areas or initial year of treatment. For more information on mating disruption, see OMAFRA Factsheet O3–079, <i>Mating Disruption for Management of Insect Pests</i> .

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Disease or Insect Group	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
First pistillate flower						
INSECTICIDES MAY BE VERY TOXIC TO BEES. DO NOT SPRAY WHEN BEES ARE WORKING. SPRAY IN THE EVENING. SEE BEE POISONING, PAGE 5.						
Butternut curculio	General Comments: Butternut curculio is not a common pest of pecan.					
	NC	Surround WP *	50 kg/ha	12 hours	1 day	Pecan only. Reduction in damage only. Apply when visual inspection shows adult feeding and egg-laying scars on new flower shoots. Repeat at 7 day intervals as needed to keep nuts covered during egg laying period. Efficacy depends on complete coverage of leaves and fruit. Light rain will help distribute product. Reapply after heavy rain, wind, overhead irrigation or new growth. Creates a white film on plant parts. Stop application once nuts are sizing. Do not use with anti-foaming agents, spreader/stickers or summer oils.
Aphids	General Comments: - Aphids on chestnut and pecan are generally controlled by natural enemies. When controlling other pests, select products with minimal impacts on beneficial insects. - Begin monitoring in mid-spring for young nymphs. If control is required, apply in early stages of aphid infestation for best results. - Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.					
	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	See comments for these products under Aphids in Prebloom .
Leafhoppers	Use one of the products listed for Leafhoppers at Prebloom . Leafhopper feeding can do significant damage to chestnut leaves and shoots, particularly on younger trees. Monitor for leafhoppers weekly beginning in mid-late spring so populations can be detected early and controls applied prior to significant leaf damage.					
Scale	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	See comments for these products under Scale in Prebloom . Scale is rarely a problem in chestnuts or pecans.
Summer sprays						
Leafroller	Use one of the products listed for Leafrollers at Prebloom . Leafrollers are generally not a problem on chestnut or pecan and will not often require control.					
Aphids	General Comments: - Aphids on chestnut and pecan are generally controlled by natural enemies. When controlling other pests, select products with minimal impacts on beneficial insects. - Begin monitoring in mid-spring for young nymphs. If control is required, apply in early stages of aphid infestation for best results. - Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.					
	3	Matador 120 EC	104 mL/ha	24 hours	14 days	Chestnut only. This group is highly toxic to beneficial insects and may lead to mite outbreaks. Maximum of 1 application per season.
	4A	Admire 240 Flowable	230 mL/ha	24 hours	7 days	Use postbloom only. Maximum of 2 applications of Group 4A insecticides per season. Repeated use may cause mite outbreaks.
	4C	Closer	100–200 mL/ha	12 hours	7 days	Where possible, rotate with insecticides outside of Group 4. Toxic to certain beneficial insects.

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Disease or Insect Group	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Summer sprays						
Aphids (cont'd)	4D	Sivanto Prime	500–750 mL/ha	12 hours	7 days	Where possible, rotate with insecticides outside of Group 4. Toxic to certain beneficial insects.
	23	Movento 240 SC	365 mL/ha	12 hours	7 days	Use postbloom only. Control may not be apparent for 2–3 weeks. Under high pest pressure, reapply 2 weeks later. Tank-mix with an adjuvant/additive that has spreading and penetrating properties at a suggested rate of 0.2% v/v. See label and Table 6–7. <i>Adjuvants Used in Ontario</i> , page 386, for further details. Do not tank-mix with sulphur (note: sulphur products are not currently registered on tree nuts).
	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	See comments for these products under Aphids in Prebloom .
		Vegol Crop Oil *	2% v/v in 700– 1,900 L water/ha	12 hours	0 days	See comments for this product under Aphids in Prebloom .
Scale	General Comments: • Scale is rarely a problem in chestnuts or pecans. • Monitor scaffold branches and apply when crawlers are active. • Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.					
	4C	Closer	200–400 mL/ha	12 hours	7 days	San Jose scale only.
	23	Movento 240 SC	585 mL/ha	12 hours	7 days	For control of San Jose scale, and suppression of Lecanium scale. Use postbloom only. Control may not be apparent for 2–3 weeks. Under high pest pressure, reapply 2 weeks later. Tank-mix with an adjuvant/additive that has spreading and penetrating properties at a suggested rate of 0.2% v/v. See label and Table 6–7. <i>Adjuvants Used in Ontario</i> , page 386, for further details. Do not tank-mix with sulphur (note: sulphur products are not currently registered on tree nuts).
	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	See comments for these products under Scale in Prebloom .
		Vegol Crop Oil *	2% v/v in 700– 1,900 L water/ha	12 hours	0 days	See comments for this product under Scale in Prebloom .
Spider mites	General Comments: • Both two-spotted spider mite and European red mite will feed on chestnut. However, plants can tolerate some damage without significantly affecting yield or crop health. • Control may not always be required, particularly when populations of predatory mites are high. If required, apply when mites are active on foliage.					
	20	Kanemite 15 SC	2.07 L/ha	12 hours	14 days	For resistance management, maximum of 1 application per season
	23	Envidor 240 SC	750 mL/ha	12 hours	7 days	Use postbloom only. Maximum of 1 application per season. Do not use in orchards inter-planted with other crops.

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Disease or Insect Group	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Summer sprays						
Spider mites (cont'd)	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	See comments for these products under Spider mites in Prebloom .
		Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	Chestnut only. Suppression only. See comments for this product under Mites in Prebloom .
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	See comments for this product under Spider mites in Prebloom .
	UN	Acramite 50 WS	568 g/ha	12 hours	14 days	Rate controls two-spotted spider mite. If European red mite is present, apply 851 g/ha. Maximum of 1 application per season.
Leafhoppers	General Comments: • Leafhopper damage to chestnut leaves and shoots can be significant in some years, particularly on younger trees. • Monitor for leafhoppers weekly beginning in mid-late spring so populations can be detected early and controls applied prior to significant leaf damage. • Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.					
	4A	Admire 240 Flowable	200 mL/ha	24 hours	7 days	Suppression only. Use postbloom only.
	NC	Surround WP *	50 kg/ha	12 hours	1 day	Chestnut only. Reduction in damage only. See comments for this product under Leafhoppers in Prebloom .
Butternut curculio	General Comments: • Butternut curculio is rarely a problem in pecan and chestnut in Ontario. • Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.					
	5	Delegate	420 g/ha	12 hours	14 days	Suppression only. Apply at first sign of feeding damage after bloom. Reapply 14 days later depending on pest pressure.
	NC	Surround WP *	50 kg/ha	12 hours	1 day	Pecan only. Reduction in damage only. Begin applications at initial infestation, as determined by monitoring. Repeat at 7–14-day intervals as needed. Efficacy depends on complete coverage of leaves and fruit. Light rain will help distribute product. Reapply after heavy rain, wind, overhead irrigation or new growth. Creates a white film on plant parts. Stop application once nuts are sizing. Do not use with anti-foaming agents, spreader/stickers or summer oils.
Botrytis grey mould	7	Fontelis	1.0–1.5 L/ha	12 hours	14 days	Chestnut only. Botrytis is not a common problem on tree nuts. Apply only if there has been a history of disease. Begin application prior to disease. Will also provide control of brown rot (<i>Monilinia</i> spp.) and suppression of Alternaria leaf spot. Contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., sulphur) may cause crop safety issues. See label for tank-mix restrictions.

— = Information not applicable or not specified on product label. * = Potentially organic. Check with certifying body.

FILBERT/HAZELNUT CALENDAR

In this section:

- Read the product label and follow all safety precautions. 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>.
- For preharvest interval, restricted entry interval, and maximum applications, see Table 6–1. *Products Used on Tree Nuts*, page 378.
- **Products are listed by chemical group and in alphabetical order within each group. The order does not reflect efficacy.** See Table 6–4. *Activity of Insecticides and Miticides on Hazelnut Pests*, page 383, and Table 6–5. *Activity of Fungicides on Eastern Filbert Blight*, page 384, for efficacy ratings.
- Where a product in the calendar is followed by a “*”, it is potentially acceptable for organic use based on *Ministère de l’Agriculture, des Pêcheries et de l’Alimentation du Québec publication Bulletin D’Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with your certifying body to verify the acceptability of any product prior to using it.

Resistance Management

To delay development of resistance to insecticides, miticides and fungicides, follow resistance management guidelines outlined in *Resistance Management Strategies*, page 393. The chemical group is indicated in the column labelled “Group” before the “Product” column. Products belonging to the same chemical group are grouped together in the calendar. Multi-site (M) fungicides are not prone to resistance and do not have to be rotated. Some products are not classified to mode of action (NC) and the mode of action has not been determined for others (U or UN).

Fungicide resistance management

Take the following steps to avoid rapid development of fungicide resistance:

- Do not reduce rates below those specified on the label.
- Do not use products containing the same chemical group in consecutive applications.

Insecticide resistance management

Take the following steps to avoid development of insecticide resistance:

- For pests with discrete generations (leafrollers), do not use insecticides from the same group for more than one generation. Within a generation, if more than one spray is required, use a product from the same chemical group.
- For pests with overlapping generations (aphids, mites), do not use products containing the same chemical group in consecutive applications.

Spray Water Volumes

Thorough coverage of all affected plant surfaces is essential for maximum efficacy of many tree nut products. Sufficient water volumes are necessary to provide complete coverage with insecticides, miticides and fungicides. Consult the product label for suggested water volumes. Otherwise, use enough water to ensure thorough spray coverage. Where the product rate is listed in amount per 1,000 L, or if a water volume is not provided on the label, use enough water to wet the foliage to the near drip point.

Bee Toxicity

Some insecticides are toxic to bees and other pollinating insects. Use of insecticides on flowering crops requires careful management to avoid negative effects on pollinators. Some insecticides cannot be applied prior to or during bloom. Use extreme caution when applying insecticides to tree nuts during bloom—do not apply them while bees are active in the orchard. Before and after bloom, bees may still be present on flowering cover crops and weeds—do not allow drift of insecticides onto these or other flowering crops. Always follow label precautions regarding avoiding impacts on bees. For more information, see *Bee Poisoning*, page 5, and honeybee toxicity ratings in Table 6–6. *Toxicity of Pesticides to Honeybees and Mite/Aphid Predators*, page 384.

Buffer Zones

Leave a suitable buffer zone between treatment area and adjacent sensitive areas, such as hedgerows, woodlots and freshwater habitats. Zones may vary depending on the product used, growth stage of the crop and method of application including the use of drift-reducing technology. Check the pesticide label for requirements.

Use Health Canada's online spray drift calculator to modify the buffer zone specified on the label based on weather conditions, category of spray equipment and 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. Unfortunately, this model does not account for carrier volume, travel speed or crop stage.

Observing buffer zones is a legal requirement. A record of the buffer zone modification, if any, must be retained for at least one year from the time of application.

Crop Nutrition

Crop nutrition is important for plant growth, fruit quality development and the acquisition of adequate cold hardiness by tree fruit. For fruit crops, soil testing, plant tissue analysis and visual deficiency symptoms all play an important role in assessing and monitoring the crop's nutritional status. For more information, visit <http://www.omafra.gov.on.ca/english/crops/hort/agrofore.html> (click on *Soil Management, Fertilizer Use, Crop Nutrition and Cover Crops for Fruit Production*) and see OMAFRA Publication 611, *Soil Fertility Handbook*. For soil testing and plant tissue analysis services, see Appendix E: *Accredited Soil-Testing Laboratories in Ontario*, page 435.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Bud break (up to 1/4-inch vegetative growth)						
Eastern filbert blight	General Comments: • Eastern filbert blight is the most significant disease of hazelnuts in Ontario. • Apply protective fungicides preventatively to protect new growth starting at bud break and continuing for approximately 8 weeks. Rotate between different fungicide groups.					
	M	Bravo ZN	6.72 L/ha	48 hours ¹ / 72 hours ² / 11 days ³ / 20 days ⁴	120 days	Apply from bud break to shoot elongation. Do not tank-mix with oils, other pesticides, surfactants or fertilizers. Do not apply within 1 week of oil. Use caution when using in a spray program with Purespray Green Spray Oil. See label for details.
		Copper Spray * or Guardsman Copper Oxychloride *	3–9 kg/ha	48 hours	2 days	Apply beginning at bud swell, when tissue is susceptible to infection. Use 3 kg/ha on small trees and up to 9 kg/ha on large trees. Apply in a high-volume spray to ensure thorough coverage.
		Cueva	1% v/v in 470– 940 L water/ha	4 hours	1 day	Do not use in combination with or closely following Vegol or Exirel. See product labels for details. When mixed with lime, these products cannot be mixed with insecticide wettable powders.

¹ General re-entry. ² Orchard maintenance. ³ Transplanting. ⁴ Scouting activities. ⁵ Hand harvest. ⁶ Hand thinning. — = Information not applicable or not specified on product label.

* = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Bud break (up to ¼-inch vegetative growth)						
Eastern filbert blight (cont'd)	3	Quash	245 g/ha	12 hours	25 days	Suppression only. For resistance management, rotate between different fungicide groups. Do not make alternate row applications.
	11	Flint	140–280 g/ha	12 hours	60 days	Apply at bud break and continue as needed on a 14-day interval. Use 140 g/ha on small trees or up to 280 g/ha on larger trees. Avoid drift, especially onto Concord grapes. For resistance management, rotate between different fungicide groups. Do not use in combination with or closely following Exirel. See labels for details.
		Quadris Flowable	900 mL/ha	12 hours	45 days	Apply beginning at bud swell, when tissue is susceptible to infection. Highly phytotoxic to certain apple varieties. Use dedicated sprayer and avoid spray drift. For resistance management, rotate between different fungicide groups. Do not use in combination with or closely following Exirel. See labels for details.
Early spring (> ¼-inch vegetative growth)						
INSECTICIDES MAY BE VERY TOXIC TO BEES. DO NOT SPRAY WHEN BEES ARE WORKING. SPRAY IN THE EVENING. SEE BEE POISONING, PAGE 5.						
Eastern filbert blight	Use one of the products listed for Eastern filbert blight at Bud break . Some products have limited numbers of applications per year. See Table 6–1. <i>Products Used on Tree Nuts</i> , page 378.					
Leafrollers	General Comments: - Obliquebanded leafrollers feed predominantly on leaves but can also feed between the husk and the nut. Examine undersides of husks for larvae from late spring through July. - Apply insecticide when larvae have emerged and before they roll up in the leaves. Reapply in 1–2 weeks, if needed. - Pheromone traps for adult flights and degree-day models for this pest in apples can be used to determine optimal spray timing. For information on calculating degree-days, see Appendix B: <i>Degree-Day Modeling</i>, page 428. - Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.					
	3	Matador 120 EC	83 mL/ha	24 hours	14 days	This group is highly toxic to beneficial insects and may lead to mite outbreaks. Maximum of 1 application per season.
	5	Delegate	210–420 g/ha	12 hours	14 days	Use higher rate under high pest pressure or for larger larvae. Reapply in 14 days if needed.
	11	Bioprotec CAF * or Dipel 2X DF *	2.8–4.0 L/ha 1.12 kg/ha	12 hours	0 days	Product must be consumed to be effective. Spray when and where pests are actively feeding. Apply in a high-volume spray to ensure thorough coverage on both sides of the leaf. Apply to young larvae, early in infestation. Death of insect may take several days. Products have short residual activity and repeat applications may be required. Use dilute spray mixture within 12 hours. For Dipel, use 1.6 kg/ha for large or mature trees.
	18	Intrepid	750 mL/ha	12 hours	14 days	For overwintering generation of obliquebanded leafroller, apply when larvae become active in the spring.

¹ General re-entry. ² Orchard maintenance. ³ Transplanting. ⁴ Scouting activities. ⁵ Hand harvest. ⁶ Hand thinning. — = Information not applicable or not specified on product label.

* = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Early spring (> ¼-inch vegetative growth)						
INSECTICIDES MAY BE VERY TOXIC TO BEES. DO NOT SPRAY WHEN BEES ARE WORKING. SPRAY IN THE EVENING. SEE BEE POISONING, PAGE 5.						
Leafrollers (cont'd)	28	Altacor	145–285 g/ha	12 hours	10 days	For overwintering generation of obliquebanded leafroller, apply when larvae become active in the spring. Tank-mixing or sequential applications of Exirel with certain fungicides (e.g., copper, Quadris, Flint), oils or other products may cause crop injury. See product label for other tank-mix restrictions.
		Exirel	0.5–1.0 L/ha	12 hours	5 days	
	NC	Surround WP *	50 kg/ha	12 hours	1 day	Reduction in damage only. Apply at first egg hatch. Make a second application 10 days later. Repeat at 7–14-day intervals as subsequent generations emerge. Efficacy depends on complete coverage of leaves and fruit. Light rain will help distribute product. Reapply after heavy rain, wind, overhead irrigation or new growth. Creates a white film on plant parts. Stop application once nuts are sizing. Do not use with anti-foaming agents, spreader/stickers or summer oils.
Aphids	General Comments: - Aphid populations on hazelnut are often kept in check by natural parasitism and predation and control will not be required. - Where control is required, apply in early stages of aphid infestation for best results. - Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.					
	1	Cygon 480-AG or Lagon 480 E	5 L/ha	5 days ¹ /21 days ⁵ /34 days ⁶	45 days	Avoid application during bloom. Apply primarily on younger trees when aphids appear. Toxic to certain beneficial insects. Use caution when using in a spray program with Purespray Green Spray Oil. See label for details.
		Warhawk 480 EC	4.2–4.8 L/ha	48 hours ¹ /4 days ⁴	14 days	Filbert aphid only. Use in 100 L/ha. This product is highly toxic to beneficial insects and may lead to mite outbreaks. Maximum of 1 application per season.
	3	Matador 120 EC	104 mL/ha	24 hours	14 days	This group is highly toxic to beneficial insects and may lead to mite outbreaks. Maximum of 1 application per season.
	4	Admire 240 Flowable	230 mL/ha	24 hours	7 days	Use postbloom only. Maximum of 2 applications of Group 4A insecticides per season. Repeated use may cause mite outbreaks.
	4C	Closer	100–200 mL/ha	12 hours	7 days	Where possible, rotate with insecticides outside of Group 4. Toxic to certain beneficial insects
	4D	Sivanto Prime	500–750 mL/ha	7 days	12 hours	Where possible, rotate with insecticides outside of Group 4. Toxic to certain beneficial insects
	23	Movento 240 SC	365 mL/ha	12 hours	7 days	Use postbloom only. Control may not be apparent for 2–3 weeks. Under high pest pressure, reapply 2 weeks later. Tank-mix with an adjuvant/additive that has spreading and penetrating properties at a suggested rate of 0.2% v/v. See label and Table 6–7. <i>Adjuvants Used in Ontario</i> , page 386, for further details. Do not tank-mix with sulphur (note: sulphur products are not currently registered on tree nuts).

¹ General re-entry. ² Orchard maintenance. ³ Transplanting. ⁴ Scouting activities. ⁵ Hand harvest. ⁶ Hand thinning. — = Information not applicable or not specified on product label.

* = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Early spring (> ¼-inch vegetative growth)						
INSECTICIDES MAY BE VERY TOXIC TO BEES. DO NOT SPRAY WHEN BEES ARE WORKING. SPRAY IN THE EVENING. SEE BEE POISONING, PAGE 5.						
Aphids (cont'd)	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	Begin applications when populations are low and reapply every 1–3 weeks as needed. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. These products must coat the bodies of susceptible, soft-bodied insects to be effective. Good coverage of all sides of plant parts is critical. Applying soaps more than 3 times may cause plant injury. See label for more information. Avoid application in direct sunlight. Use caution when applying to new seedlings or blooms. Do not apply when plants are under stress. Application within 3 days of sulphur may increase plant injury on sensitive plants (note: sulphur products are not currently registered on tree nuts).
		Vegol Crop Oil *	2% v/v in 700– 1,900 L water/ha	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. Do not apply within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of copper or 30 days of sulphur (note: no sulphur products are currently registered on tree nuts). Do not apply to wet foliage. Avoid application during bloom.
Spider mites	General Comments: - Foliar mites on hazelnuts, such as spider and rust mites, are usually controlled by natural predators. Populations may increase to damaging levels on water-stressed trees or where insecticides applied for other pests have reduced levels of beneficial insects. - Where control of foliar mites is required, treat in late spring or early summer if populations become high and leaf bronzing appears. - There are no miticides currently registered for bud mite, the main yield-limiting mite pest of hazelnut.					
	20	Kanemite 15 SC	2.07 L/ha	12 hours	14 days	For resistance management, maximum of 1 application per season.
	23	Envidor 240 SC	750 mL/ha	12 hours	7 days	Use postbloom only. Maximum of 1 application per season. Do not use in orchards inter-planted with other crops.
	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	Begin applications when populations are low and reapply every 1–3 weeks as needed. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. These products must coat the bodies of susceptible, soft-bodied insects to be effective. Good coverage of all sides of plant parts is critical. Applying soaps more than 3 times may cause plant injury. See label for more information. Avoid application in direct sunlight. Use caution when applying to new seedlings or blooms. Do not apply when plants are under stress. Application within 3 days of sulphur may increase plant injury on sensitive plants (note: sulphur products are not currently registered on tree nuts).

¹ General re-entry. ² Orchard maintenance. ³ Transplanting. ⁴ Scouting activities. ⁵ Hand harvest. ⁶ Hand thinning. — = Information not applicable or not specified on product label.

* = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Early spring (> ¼-inch vegetative growth)						
INSECTICIDES MAY BE VERY TOXIC TO BEES. DO NOT SPRAY WHEN BEES ARE WORKING. SPRAY IN THE EVENING. SEE BEE POISONING, PAGE 5.						
Spider mites (cont'd)	NC	Purespray Green Spray Oil 13 E *	10 L/1,000 L water	12 hours	—	Suppression only. Apply in a high-volume spray to ensure thorough coverage. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. Use caution when using in a spray program with Cygon, Lagon or Bravo. See label for details. Do not apply within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of using sulphur (note: no sulphur products are currently registered on tree nuts). See label for compatibility with other products.
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. Do not apply within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of copper or 30 days of sulphur (note: no sulphur products are currently registered on tree nuts). Do not apply to wet foliage. Avoid application during bloom.
	UN	Acramite 50 WS	568 g/ha	12 hours	14 days	Rate controls two-spotted spider mite. If European red mite is present, apply 851 g/ha. Maximum of 1 application per season.
Scale	General Comments: - Scale insects on hazelnut are often kept in check by natural predation. However, in some orchards populations can increase to damaging levels. - Monitor scaffold branches for adult scale. Spray when crawlers are active which is typically mid to late summer for Lecanium scale. - Some of these products are toxic to bees. Do not apply when bees are active on flowering weeds or other crops in the treatment area. Refer to label for specific bee toxicity statements.					
	4C	Closer	200–400 mL/ha	12 hours	7 days	San Jose scale only. Where possible, rotate with insecticides outside of Group 4 between generations. Toxic to certain beneficial insects
	23	Movento 240 SC	585 mL/ha	12 hours	7 days	Control of San Jose scale and suppression of Lecanium scale. Use postbloom only. Control may not be apparent for 2–3 weeks. Under high pest pressure, reapply 2 weeks later. Tank-mix with an adjuvant/additive that has spreading and penetrating properties at a suggested rate of 0.2% v/v. See label and Table 6–7. <i>Adjuvants Used in Ontario</i> , page 386, for further details. Do not tank-mix with sulphur (note: no sulphur products are currently registered on tree nuts).

¹ General re-entry. ² Orchard maintenance. ³ Transplanting. ⁴ Scouting activities. ⁵ Hand harvest. ⁶ Hand thinning. — = Information not applicable or not specified on product label.

* = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Early spring (> ¼-inch vegetative growth)						
INSECTICIDES MAY BE VERY TOXIC TO BEES. DO NOT SPRAY WHEN BEES ARE WORKING. SPRAY IN THE EVENING. SEE BEE POISONING, PAGE 5.						
Scale (cont'd)	NC	Kopa * or Opal *	14 L/700 L water – 38 L/1,900 L water	12 hours	0 days	Begin applications when populations are low and reapply every 1–3 weeks as needed. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. These products must coat the bodies of susceptible, soft-bodied insects to be effective. Good coverage of all sides of plant parts is critical. Applying soaps more than 3 times may cause plant injury. See label for more information. Avoid application in direct sunlight. Use caution when applying to new seedlings or blooms. Do not apply when plants are under stress. Application within 3 days of sulphur may increase plant injury on sensitive plants (note: sulphur products are not currently registered on tree nuts).
		Vegol Crop Oil *	2% v/v in 700–1,900 L water/ha	12 hours	0 days	Apply in a high-volume spray to ensure thorough coverage. Tolerance has not been determined for all nut varieties. Test a small area of each variety prior to spraying the whole block. Do not apply within 48 hours of freezing temperatures, when temperatures are high (above 30°C), prior to rain or to heat- or moisture-stressed trees. Do not use within 14 days of copper or 30 days of sulphur (note: no sulphur products are currently registered on tree nuts). Do not apply to wet foliage. Avoid application during bloom.
Leafhopper	General Comments: - In Ontario hazelnuts, leafhoppers are generally only economically damaging on young trees. - Monitor crops for presence of leafhoppers beginning in mid-late spring. If control is required, apply early in infestation for best results.					
	4A	Admire 240 Flowable	200 mL/ha	24 hours	7 days	Suppression only. Toxic to bees. Apply only after bloom and do not apply to flowering weeds and cover crops if bees are active in the treatment area. Maximum of 2 applications of Group 4A insecticides per season. Repeated use may cause mite outbreaks.
Dogwood borer	NC	Isomate DWB	250–375 dispensers/ha	—	—	Dogwood borer is not commonly a pest of tree nuts. Apply where there is a history of infestation. Reduces mating of dogwood borer. Apply before adult borer emergence (end of May). Use high rate for high-pressure areas or initial year of treatment. For more information on mating disruption, see OMAFRA Factsheet 03–079, <i>Mating Disruption for Management of Insect Pests</i> .
Summer						
Aphids	Use one of the products listed for Aphids at Early spring (> ¼-inch vegetative growth) .					
Leafhopper	Use one of the products listed for Leafhoppers at Early spring (> ¼-inch vegetative growth) .					
Leafroller	Use one of the products listed for Leafrollers at Early spring (> ¼-inch vegetative growth) .					

¹ General re-entry. ² Orchard maintenance. ³ Transplanting. ⁴ Scouting activities. ⁵ Hand harvest. ⁶ Hand thinning. — = Information not applicable or not specified on product label.

* = Potentially organic. Check with certifying body.

Disease or Insect	Group	Product	Rate	Restricted Entry Interval	Preharvest Interval	Product Specific Comments
Summer						
Spider mites	Use one of the products listed for Mites at Early spring (> ¼-inch vegetative growth) .					
Scale	Use one of the products listed for Scale at Early spring (> ¼-inch vegetative growth) .					
Botrytis grey mould	7	Fontelis	1.0–1.5 L/ha	12 hours	14 days	Botrytis is not a common problem on tree nuts. Apply only if there has been a history of disease. Begin application prior to disease development. Will also provide control of brown rot (<i>Monilinia</i> spp.) and suppression of Alternaria leaf spot. Contains mineral oil in the formulation. Tank-mixing or rotating with oil-sensitive products (e.g., sulphur) may cause crop safety issues. See label for tank-mix restrictions.
Bacterial blight	General Comments: • Young hazelnut trees less than 10 years old are particularly susceptible to bacterial blight. • Apply 1 to 2 sprays after harvest but before fall rains. For severe infections or heavy rains, a 3rd application can be made when ¾ of the leaves have dropped.					
	M	Copper Spray * or Guardsman Copper Oxychloride 50 *	3–9 kg/ha	48 hours	2 days	Apply the first spray in late August or early September before the start of the fall rains and nut drop. Repeat after harvest at leaf fall and in early spring just before leaf bud break. Use 3 kg/ha on small trees, and up to 9 kg/ha on large trees in proportionately more water. Apply in a high-volume spray to ensure thorough coverage. Do not use in combination with or closely following Vegol or Exirel. See product labels for details. When mixed with lime, these products cannot be mixed with insecticide wettable powders.
		Cueva	1% v/v in 470– 940 L water/ha	4 hours	1 day	May cause leaf spots during excessive moisture and cold. If concerned about sensitivity of plants, apply first to small areas. Do not use in combination with or closely following Vegol or Exirel. See product labels for details.

¹ General re-entry. ² Orchard maintenance. ³ Transplanting. ⁴ Scouting activities. ⁵ Hand harvest. ⁶ Hand thinning. — = Information not applicable or not specified on product label.

* = Potentially organic. Check with certifying body.

Table 6–1. Products Used on Tree Nuts

Use this table as a guide but refer to product label for specific information.

The **preharvest interval** is the number of days between the last spray and first harvest.

The **restricted entry interval** is the minimum interval that must be observed between application of the pesticide and work in the treated crop without protective equipment. If no re-entry period is stated on the label, assume it is 12 hours.

The **maximum number** of applications is the labelled maximum number for the growing season and may be higher than what is recommended for resistance management or for the preservation of beneficial insects.

Products listed as **potentially organic** may be acceptable for organic use based on *Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec publication Bulletin D'Information No. 6, 2 juin 2017* or a letter of certification provided by the registrant. Check with certifying body to verify the acceptability of any product prior to using it.

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic	Registered Nut Crops ¹
Products for insect control or suppression								
Acramite 50 WS	27925	bifenazate	UN	14 days	12 hours	1	—	W, P, C, H
Admire 240 Flowable	24094	imidacloprid	4A	7 days	24 hours	2	—	W, P, C, H
Altacor	28981	chlorantraniliprole	28	10 days	12 hours	3 (max. 645 g/ha)	—	W, P, C, H
Bioprotec CAF	26854	<i>Bacillus thuringiensis</i>	11	0 days	12 hours	—	✓	W, P, C, H
Closer	30826	sulfoxaflor	4C	7 days	12 hours	2	—	W, P, C, H
Cygon 480-AG	25651	dimethoate	1B	45 days	5 days ² /21 days ³ / 34 days ⁴	1	—	H
Delegate	28778	spinetoram	5	14 days	12 hours	3	—	W, P, C, H
Dipel 2X DF	26508	<i>Bacillus thuringiensis</i>	11	0 days	12 hours	—	✓	W, P, C, H
Entrust	30382	spinosad	5	14 days	when dry	3	✓	W
Envirdor 240 SC	28051	spirodiclofen	23	7 days	12 hours	1	—	W, P, C, H
Exirel	30895	cyantraniliprole	28	5 days	12 hours	4	—	W, P, C, H
GF-120 Fruit Fly Bait	28336	spinosad bait	5	0 days	when dry	10	✓	W
Intrepid	27786	methoxyfenozide	18	14 days	12 hours	max. 2 L/ha	—	W, P, C, H
Isomate-CM/OFM TT	29352	pheromone, oriental fruit moth and codling moth	NC	—	—	—	✓	W
Isomate DWB	30589	pheromone, dogwood borer	NC	—	—	—	—	W, P, C, H
Kanemite 15 SC	28641	acequinocyl	20B	14 days	12 hours	2	—	W, P, C, H

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. UN = Mode of action has not been determined.

— = Information is not specified on the product label. ✓ = Potentially organic. Check with certifying body.

¹ Indicates which nut crops product is registered on W = walnut, P = pecan, C = chestnut, H = hazelnut. ² General re-entry. ³ Hand harvest or laying irrigation pipe. ⁴ Hand thinning.

⁵ Maximum of 3 consecutive applications to ensure plant injury does not occur. Additional applications may be possible if previous experience with repeat applications of the product under the same conditions have not produced plant injury. ⁶ Maximum 6 applications per year with no more than 2 dormant applications. ⁷ Scouting activities. ⁸ Orchard maintenance. ⁹ Transplanting.

¹⁰ Preharvest interval is 2 days for hazelnut or 40 days for walnut. ¹¹ Maximum 3 applications per year for hazelnut or 4 applications per year for walnut.

Table 6–1. Products Used on Tree Nuts (cont'd)

Product Name	Registration Number	Common Name	Group	Preharvest Interval	Restricted Entry Interval	Maximum Applications	Potentially Organic	Registered Nut Crops ¹
Products for insect control or suppression								
Kopa	31433	potassium salts of fatty acids	NC	0 days	12 hours	3 ⁵	✓	W, P, C, H
Lagon 480 E	9382	dimethoate	1B	45 days	5 days ² /21 days ³ / 34 days ⁴	1	—	H
Matador 120 EC	24984	lambda-cyhalothrin	3	14 days	24 hours	max. 390 mL/ha	—	W, C, H
Movento 240 SC	28953	spirotetramat	23	7 days	12 hours	max. 1.58 L/ha	—	W, P, C, H
Opal	28146	potassium salts of fatty acids	NC	0 days	12 hours	3 ⁵	✓	W, P, C, H
Purespray Green Spray Oil 13 E	27666	mineral oil	NC	—	12 hours	8	✓	C, H
Sivanto Prime	31452	flupyradifurone	4D	7 days	12 hours	max. 2 L/ha	—	W, P, C, H
Surround WP	27469	kaolin	NC	1 day	12 hours	—	✓	W, P, C, H
Vegol Crop Oil	32408	canola oil	NC	0 days	12 hours	2/4 ⁶	✓	W, P, C, H
Warhawk 480 EC	29984	chlorpyrifos	1B	14 days	48 hours ² /4 days ⁷	3	—	H
Products for disease control or suppression								
Bravo ZN	28900	chlorothalonil	M	120 days	48 hours ² /3 days ⁸ / 11 days ⁹ /20 days ⁷	3	—	H
Copper Spray	19146	copper oxychloride	M	2 days/40 days ¹⁰	48 hours	3/4 ¹¹	✓	W, H
Cueva	31825	copper octanoate	M	1 day	4 hours	15	—	W, H
Flint	30619	trifloxystrobin	11	60 days	12 hours	4	—	H
Fontelis	30331	penthiopyrad	7	14 days	12 hours	max. 4.5 L/ha	—	W, C, H
Guardsman Copper Oxychloride 50	13245	copper oxychloride	M	2 days	48 hours	3	✓	H
Kasumin 2L	30591	kasugamycin	24	100 days	12 hours	4	—	W
Quadris Flowable	26153	azoxystrobin	11	45 days	12 hours	4	—	H
Quash	30402	metconazole	3	25 days	12 hours	4 (max. 980 g/ha)	—	H

M = Multi-site fungicides. NC = Not classified by FRAC/IRAC, or group not indicated on product label. UN = Mode of action has not been determined.

— = Information is not specified on the product label. ✓ = Potentially organic. Check with certifying body.

¹ Indicates which nut crops product is registered on W = walnut, P = pecan, C = chestnut, H = hazelnut. ² General re-entry. ³ Hand harvest or laying irrigation pipe. ⁴ Hand thinning.

⁵ Maximum of 3 consecutive applications to ensure plant injury does not occur. Additional applications may be possible if previous experience with repeat applications of the product under the same conditions have not produced plant injury. ⁶ Maximum 6 applications per year with no more than 2 dormant applications. ⁷ Scouting activities. ⁸ Orchard maintenance. ⁹ Transplanting.

¹⁰ Preharvest interval is 2 days for hazelnut or 40 days for walnut. ¹¹ Maximum 3 applications per year for hazelnut or 4 applications per year for walnut.

Notes on Tree Nut Insects and Diseases

Use the information in the following notes to assist with choosing the best product for the pest complex present. Consider the life stage present and resistance management strategies, as well as the activity of each product to pests and beneficial insects.

In this section:

- Table 6–2.** *Activity of Insecticides and Miticides on Walnut Pests, page 381.*
- Table 6–3.** *Activity of Insecticides and Miticides on Chestnut and Pecan Pests, page 382.*
- Table 6–4.** *Activity of Insecticides and Miticides on Hazelnut Pests, page 383.*
- Table 6–5.** *Activity of Fungicides on Eastern Filbert Blight, page 384.*
- Table 6–6.** *Toxicity of Pesticides to Honeybees and Mite/Aphid Predators, page 384.*

Information in Tables 6–2 to 6–4 is based partly on information from other tree fruit in Ontario and the northeastern United States. Impact on these insects in tree nuts is expected to be similar to that of apples. However, differences in production systems, timing of applications and other factors may change efficacy of these products.

Table 6–2. Activity of Insecticides and Miticides on Walnut Pests

Use products only for pests listed on the product label for the crop. The information provided in this table is intended to assist the grower in choosing the best insecticide for control of pests listed on the product label, while managing resistance and avoiding unnecessary sprays for non-target pests. Efficacy can be affected by rate of the product.

Insecticide	Husk maggot ¹	Codling moth	Dogwood borer	Japanese beetle	Leafrollers	Potato leafhopper	Butternut curculio ²	Scale	Spring-feeding caterpillar	Aphids	Mites	
											European red mite	Two-spotted spider mite
Acramite 50 WS	0	0	0	0	0	0	0	0	0	0	✓ *	✓ *
Admire 240 Flowable	✓s	—	—	✓s	—	✓ *	—	✓s	—	✓ *	0	0
Altacor	✓s	✓ *	✓	✓s	✓ *	—	✓s	✓s	✓	✓s	0	0
Bioprotec CAF	0	✓s	—	—	✓ *	0	0	—	✓	0	0	0
Closer	—	—	—	—	—	✓	—	✓ *	—	✓ *	0	0
Delegate	✓s *	✓ *	✓	—	✓ *	—	✓s *	—	✓	0	0	0
Dipel 2X DF	0	✓s	—	—	✓ *	0	0	—	✓	0	0	0
Entrust	✓s	✓s *	—	—	✓ *	0	✓s	—	✓	0	0	0
Envirod 240 SC	0	0	0	0	0	0	0	0	0	0	✓ *	✓ *
Exirel	✓	✓ *	—	✓	✓ *	✓s	✓	—	✓	—	0	0
GF-120 Fruit Fly Bait	✓ *	—	—	—	—	—	—	—	—	—	—	—
Intrepid	0	✓ *	—	—	✓ * R	0	0	0	✓	—	0	0
Kanemite 15 SC	0	0	0	0	0	0	0	0	0	—	✓	✓ *
Matador 120 EC	✓ *	✓ *	—	✓	✓s * R	✓	✓s *	✓s	✓	✓ *	0	0
Movento 240 SC	—	—	—	—	—	—	—	✓ *	—	✓ *	0	0
Sivanto Prime	—	—	—	—	—	✓	—	✓	—	✓ *	0	0
Surround WP	✓s *	✓s	—	✓s	✓s *	✓s	✓s *	✓s	✓s	✓s	✓s	0
Vegol Crop Oil	—	—	—	—	—	—	—	✓s *	—	✓s *	✓	✓s *

* (shaded area) = Pest is listed on the product label for control or suppression. ✓ = Has activity on the pest if applied at the right time. 0 = Not effective. — = Information is unavailable.
s = Suppression or reduction in damage only. R = Resistance in other fruit crops. exp = Works only on exposed migrating mites, not on growth stages within buds.

¹ Efficacy based on apple maggot in Ontario apples. Impact on the closely related walnut husk fly should be similar but may vary between the two cropping systems.

² Efficacy based on plum curculio in Ontario apples. Impact on the closely related butternut curculio should be similar but may vary between the two cropping systems.

Ratings are based on moderate insect or mite pressure. Efficacy may be affected by rate of insecticide used, as well as coverage, timing and residual of the product. In some orchards, resistance may cause control failures when present. See *Pest Resistance to Fungicides, Insecticides and Miticides*, page 402. Products must be applied at proper timings and label rates for each pest. Consult label or walnut calendar for this information.

Source: Various extension publications (*Cornell Pest Management Guidelines for Tree Fruit, Pennsylvania Tree Fruit Production Guide*), scientific journal articles and Ontario field trials. Efficacy assessments come predominantly from apples in Ontario and the northeast. Impact on these insects in tree nuts is expected to be similar to that of apples, however differences in production systems timing of applications and other factors may change efficacy of these products.

Table 6–3. Activity of Insecticides and Miticides on Chestnut and Pecan Pests

Use products only for pests listed on the product label for the crop. The information provided in this table is intended to assist the grower in choosing the best insecticide for control of pests listed on the product label, while managing resistance and avoiding unnecessary sprays for non-target pests. Efficacy can be affected by rate of the product. Some of the products listed below are registered on only pecan or only chestnut. See Chestnut and Pecan Calendar for details.

Insecticide	Japanese beetle	Leafrollers	Potato leafhopper	Weevils ¹	Scale	Spring-feeding caterpillar	Aphids	Mites	
								European red mite	Two-spotted spider mite
Acramite 50 WS	0	0	0	0	0	0	0	✓ *	✓ *
Admire 240 Flowable	✓s	—	✓ *	—	✓s	—	✓ *	0	0
Altacor	✓s	✓ *	—	✓s	✓s	✓	✓s	0	0
Bioprotec CAF	—	✓ *	0	0	—	✓	—	0	0
Closer	—	—	✓	—	✓ *	—	✓ *	0	0
Delegate	—	✓ *	—	✓s *	—	✓	—	0	0
Dipel 2X DF	—	✓ *	0	0	—	✓	—	0	0
Envirdor 240 SC	0	0	0	0	0	0	—	✓ *	✓ *
Exirel	✓	✓ *	✓s	✓	—	✓	—	0	0
Intrepid	—	✓ * R	0	0	0	✓	—	0	0
Kanemite 15 SC	0	0	0	0	0	0	—	✓	✓ *
Matador 120 EC	✓	✓s * R	✓	✓s	✓s	✓	✓ *	0	0
Movento 240 SC	—	—	—	—	✓ *	—	✓ *	0	0
Purespray Green Spray Oil 13 E (summer)	—	—	—	—	✓s	—	✓s	✓ *	✓s *
Sivanto Prime	—	—	✓	—	✓	—	✓ *	0	0
Surround WP	✓s	✓s	✓s *	✓s *	✓s	✓s	—	✓s	0
Vegol Crop Oil	—	—	—	—	✓s *	—	✓s *	✓	✓s *

* (shaded area) = Pest is listed on the product label for control or suppression. ✓ = Has activity on the pest if applied at the right time. 0 = Not effective, — = Information is unavailable. s = Suppression or reduction in damage only. R = Resistance in other fruit crops. exp = Works only on exposed migrating mites, not on growth stages within buds.

¹ Efficacy based on plum curculio in Ontario apples. Impact on butternut curculio and chestnut weevil should be similar but may vary between the two cropping systems.

Ratings are based on moderate insect or mite pressure. Efficacy may be affected by rate of insecticide used, as well as coverage, timing and residual of the product. In some orchards, resistance may cause control failures when present. See *Pest Resistance to Fungicides, Insecticides and Miticides*, page 402. Products must be applied at proper timings and label rates for each pest. Consult label or chestnut/pecan calendar for this information.

Source: Various extension publications (*Cornell Pest Management Guidelines for Tree Fruit*, *Pennsylvania Tree Fruit Production Guide*), scientific journal articles and Ontario field trials. Efficacy assessments come predominantly from apples in Ontario and the northeast. Impact on these insects in tree nuts is expected to be similar to that of apples, however differences in production systems timing of applications and other factors may change efficacy of these products.

Table 6–4. Activity of Insecticides and Miticides on Hazelnut Pests

Use products only for pests listed on the product label for the crop. The information provided in this table is intended to assist the grower in choosing the best insecticide for control of pests listed on the product label, while managing resistance and avoiding unnecessary sprays for non-target pests. Efficacy can be affected by rate of the product.

Insecticide	Brown marmorated stink bug	Japanese beetle	Oblique-banded leafroller	Potato leafhopper	Weevils ¹	Scale	Spring-feeding caterpillar	Aphids	Mites		
									Bud mite	European red mite	Two-spotted spider mite
Acramite 50 WS	0	0	0	0	0	0	0	—	—	✓ *	✓ *
Admire 240 Flowable	✓s	✓s	—	✓ *	—	✓s	—	✓ *	—	0	0
Altacor	✓s	✓s	✓ *	—	✓s	✓s	✓	✓s	—	0	0
Bioprotec CAF	—	—	✓ *	0	0	—	✓	—	—	0	0
Closer	✓s	—	—	✓	—	✓ *	—	✓ *	—	0	0
Cygon 480 AG	—	—	0	✓	0	✓	—	✓ *	—	—	—
Delegate	✓s	—	✓ *	—	✓s *	—	✓	—	—	0	0
Dipel 2X DF	—	—	✓ *	0	0	—	✓	—	—	0	0
Envior 240 SC	0	0	0	0	0	0	0	—	✓ exp	✓ *	✓ *
Exirel	—	✓	✓ *	✓s	✓	—	✓	—	—	0	0
Intrepid	✓s	—	✓ * R	0	0	0	✓	—	—	0	0
Kanemite 15 SC	0	0	0	0	0	0	0	—	—	✓	✓ *
Lagon	—	—	0	✓	0	✓	—	✓ *	—	—	—
Matador 120 EC	✓s	✓	✓s * R	✓	✓s	✓s exp	✓	✓ *	—	0	0
Movento 240 SC	—	—	—	—	—	✓ *	—	✓ *	—	0	0
Purespray Green Spray Oil 13 E (summer)	—	—	—	—	—	✓s	—	✓s	—	✓ *	✓s *
Sivanto Prime	—	—	—	✓	—	✓	—	✓ *	—	0	0
Surround WP	✓s	✓s	✓s *	✓s *	✓s *	✓s	✓s	—	—	✓s	0
Vegol Crop Oil	—	—	—	—	—	✓s *	—	✓s *	—	✓	✓s *
Warhawk 480 EC	✓	—	—	—	✓	✓	—	✓ *	—	—	—

* (shaded area) = Pest is listed on the product label for control or suppression. ✓ = Has activity on the pest if applied at the right time. 0 = Not effective, — = Information is unavailable. s = Suppression or reduction in damage only. R = Resistance in other fruit crops. exp = Works only on exposed migrating mites, not on growth stages within buds.

¹ Efficacy based on plum curculio in Ontario apples. Impact on weevil pests in hazelnut should be similar but may vary between the two cropping systems.

Ratings are based on moderate insect or mite pressure. Efficacy may be affected by rate of insecticide used, as well as coverage, timing and residual of the product. In some orchards, resistance may cause control failures when present. See *Pest Resistance to Fungicides, Insecticides and Miticides*, page 402. Products must be applied at proper timings and label rates for each pest. Consult label or hazelnut calendar for this information.

Source: Various extension publications (*Cornell Pest Management Guidelines for Tree Fruit, Pennsylvania Tree Fruit Production Guide*), scientific journal articles and Ontario field trials. Efficacy assessments come predominantly from apples in Ontario and the northeast. Impact on these insects in tree nuts is expected to be similar to that of apples, however differences in production systems timing of applications and other factors may change efficacy of these products.

Table 6–5. Activity of Fungicides on Eastern Filbert Blight (EFB)

Use fungicides only for the disease listed on the product label for the crop. The information provided in this table is intended to assist the grower in choosing the best fungicide for control of pests listed on the product label, while managing resistance and avoiding unnecessary sprays for non-target pests. Efficacy can be affected by rate of the product or by the presence of resistant populations. See *Resistance management strategies by fungicide group and disease for Ontario fruit crops*, page 394.

Group	Fungicide	Active Ingredient	EFB Control
M1	Copper Spray	copper oxychloride	— *
M1	Guardsman Copper Oxychloride	copper oxychloride	— *
M1	Cueva	copper octanoate	— *
M5	Bravo ZN	chlorothalonil	4
3	Quash	metconazole	3
11	Quadris Flowable	azoxystrobin	2–3
11	Flint	trifloxystrobin	3–4

0 = Not effective. 1 = Slight control. 2 = Fair. 3 = Good. 4 = Excellent. — = Information not available.

Adapted from *Pest Management Guide for the Willamette Valley*, Oregon State University Extension Service. Ratings are relative and based on full application rates and proper coverage/spray timing. Actual control will be affected by these factors and others including tree cultivar, disease pressure and weather conditions.

* Copper oxychloride and copper octanoate were not evaluated in Oregon trials. However another formulation of copper, copper hydroxide, was evaluated against Eastern Filbert Blight in Oregon and was found to provide good control (ranking = 3) relative to other products evaluated.

Table 6–6. Toxicity of Pesticides to Honeybees and Mite/Aphid Predators

Product	Honeybees ¹	Stethorus (spider mite destroyer)	Predatory mites		Aphidoletes (Aphid midge)	Ladybugs	Minute pirate bugs	Lacewings	Fly and wasp parasitoids
			Typhlodromus pyri	Amblyseius fallacis					
Insecticides									
Admire 240 Flowable	VT	MT	ST	ST	ST	MT	MT	MT	MT
Altacor	NT	NT	NT	NT	NT	NT	NT	NT	NT
Bioprotec CAF	NT	NT	NT	NT	NT	NT	NT	NT	NT
Closer	VT	—	—	—	—	—	—	—	—
Cygon 480 AG	VT	MT	VT	VT	VT	—	—	—	—

NT = Non toxic. ST = Slightly toxic. MT = Moderately toxic. VT = Very toxic. I = Irritant. — = No information is available. Consult label or manufacturer for more information.

¹ Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

² May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

Only registered products with toxicity data available are listed in this table. Consult label or manufacturer for more information.

Adapted from *Cornell Pest Management Guidelines for Tree Fruit* and the *Pennsylvania Tree Fruit Production Guide* information tree nut products registered on other tree fruit.

Table 6–6. Toxicity of Pesticides to Honeybees and Mite/Aphid Predators (cont'd)

Product	Honeybees ¹	Stethorus (spider mite destroyer)	Predatory mites		Aphidoletes (Aphid midge)	Ladybugs	Minute pirate bugs	Lacewings	Fly and wasp parasitoids
			Typhlodromus pyri	Amblyseius fallacis					
Insecticides									
Delegate	VT	ST	MT	MT	ST	ST	ST	ST	MT
Dipel 2X DF	NT	NT	NT	NT	NT	NT	NT	NT	NT
Entrust	VT	NT	ST	ST	NT	NT	NT	NT	ST
Exirel	VT	MT	ST	ST	ST	MT	ST	ST	MT
GF-120 Fruit Fly Bait	VT	NT	ST	ST	NT	NT	NT	NT	ST
Intrepid	NT	NT	NT	NT	NT	NT	NT	NT	NT
Lagon 480 E	VT	MT	VT	VT	VT	—	—	—	—
Matador 120 EC	VT	VT	VT	VT	VT	VT	VT	VT	VT
Movento 240 SC	VT ²	ST	NT	NT	ST	ST	ST	ST	—
Sivanto Prime	MT	MT	NT	NT	MT	MT	MT	MT	VT
Surround WP	I	MT	MT	MT	MT	MT	—	ST	MT
Warhawk 480 EC	VT	MT	MT	MT	—	—	—	—	—
Miticides									
Acramite 50 WS	MT	NT	MT	MT	ST	NT	NT	NT	—
Envirdor 240 SC	MT	MT	NT	NT	—	—	—	—	—
Kanemite 15 SC	NT	ST	ST	ST	—	—	—	—	—
Purespray Green Spray Oil 13 E	—	ST	MT	MT	ST	ST	ST	ST	—
Vegol Crop Oil	—	ST	MT	MT	ST	ST	ST	ST	—
Fungicides									
Copper Spray	NT	—	—	—	—	—	—	—	—
Cueva	NT	—	—	—	—	—	—	—	—
Flint	NT	ST	NT	NT	—	—	—	—	—
Fontelis	NT	—	—	—	—	—	—	—	—
Kasumin	NT	—	—	—	—	—	—	—	—
Quadris Flowable	NT	ST	NT	NT	—	—	—	—	—

NT = Non toxic. ST = Slightly toxic. MT = Moderately toxic. VT = Very toxic. I = Irritant. — = No information is available. Consult label or manufacturer for more information.

¹ Source: PMRA Environmental Assessment Division. For more detailed information on the toxicity of specific pesticides to honeybees, refer to the pesticide label.

² May be toxic to bee colonies exposed to direct treatment, drift or residues on flowering crops or weeds.

Only registered products with toxicity data available are listed in this table. Consult label or manufacturer for more information.

Adapted from *Cornell Pest Management Guidelines for Tree Fruit* and the *Pennsylvania Tree Fruit Production Guide* information tree nut products registered on other tree fruit.

Adjuvants Used in Fruit Crops

Spray adjuvants are tank-mix additives used to modify and enhance the effectiveness of the pesticide. They include surfactants, spreader/stickers, crop oils, anti-foaming agents, buffering agents, etc. Unless the product label specifies an adjuvant be added to the tank, growers do not need to use them.

A label may specify a particular name brand, or generalize a category of adjuvant. In the latter case, the grower is free to use any adjuvant in that category, provided it is registered for use on the crop. Always use adjuvants as directed on the product label. See Table 6–7. *Adjuvants Used in Ontario*, on this page, for common adjuvants used in fruit crops.

Table 6–7. Adjuvants Used in Ontario

Some pesticides used together or in close succession to crop oils or other adjuvants can cause crop injury. Do not use Supra Captan, Maestro, Folpan, Bravo, Echo or sulphur-based products with crop oils or adjuvants which are used to increase pesticide uptake. Crop safety issues can also occur around some formulations of copper or specific products, such as Group 11 fungicides. Read product labels closely for additional precautions around product compatibility with surfactants or crop oils. For more information on adjuvants, see sprayers101.com or Purdue Extension, *Adjuvants and the Power of the Spray* at ppp.purdue.edu/wp-content/uploads/2016/08/PPP-107.pdf.

Trade Name	Registration Number	Adjuvant Type	Characteristics
Agral 90	11809 24725	non-ionic surfactant	• wetter-spreader • compatible with most pesticides¹ • helps pesticide penetrate plant cuticle
Ipco Ag-Surf	15881	non-ionic surfactant	• wetter-spreader • compatible with most pesticides¹ • helps pesticide penetrate plant cuticle
LI 700	23026	non-ionic surfactant	• wetter-spreader • compatible with most pesticides¹ • helps pesticide penetrate plant cuticle • additional properties: pH adjuster, sticker
Purespray Green Spray Oil 13 E	27666	crop oil (mineral)	• helps pesticide penetrate plant cuticle or insect exoskeleton
Xiameter OFX-0309	23078	silicone surfactant (organosilicone)	• wetter-spreader • helps pesticide penetrate plant cuticle • reduces surface tension • improves rainfastness

¹ Check product label for precautions around surfactant compatibility before using.

Plant Parasitic Nematodes in Ontario

There are many beneficial nematodes in agricultural soil, however some nematodes are plant parasitic. When plant parasitic nematodes are present in high numbers in soil, they can cause significant yield losses to horticultural crops. The extent of loss depends on the crop, nematode species and soil populations.

The most destructive and common plant parasitic nematodes in Ontario fruit crops are root-lesion (*Pratylenchus penetrans*) and northern root-knot (*Meloidogyne hapla*). The northern root-knot nematode is becoming more prevalent. The pin (*Paratylenchus sp.*) and dagger (*Xiphinema sp.*) nematodes occasionally cause yield losses to some fruit crops in isolated fields. The dagger nematode is mainly a virus vector on grape, raspberry and apple.

Generally, symptoms of nematode injury include:

- uneven plant growth
- poor plant establishment
- plants weakening over time
- poor root growth
- knots or galls on roots
- excessive branching of roots, hairy root symptoms

On strawberries:

- Root-lesion nematodes cause discolouration of the fine feeder roots and tiny brown scratch-like lesions on the young white roots. These lesions merge to form large brown areas. Root-lesion nematodes are involved in the black root rot complex and aggravate verticillium wilt of strawberries and other host plants. Severely infected plants appear stunted and unthrifty.
- Root-knot nematode feeding stimulates root cells to enlarge. Groups of enlarged cells look like small galls or beads (1 mm). As more and more nematodes establish feeding sites in the same region of the root, the groups of enlarged cells become one larger root-knot.

On raspberries:

- Root-lesion nematode feeding causes scratch-like lesions on roots, similar to the symptoms on strawberry roots. Severely infested plants have thinner and fewer canes per crown. Up to 25% of first-year canes may be killed by severe infestations of these nematodes.
- Dagger nematodes spread tomato ringspot virus, which causes crumbly berries, mottled leaves and cane dieback.

On tree fruits:

- Root-lesion nematodes can be a major cause of orchard replant failures, and are a significant factor in Apple Replant Disorder (ARD). They can also cause a decline in vigour of existing peach and cherry orchards. These nematodes cause small brown lesions on the white lateral roots and kill the fine feeder roots. When lesions merge, the entire root system appears discoloured. Root lesions are frequently invaded by other pathogens which can cause root rot. Severely affected trees may lose all feeder roots. Young replant trees may die. Existing trees lack uniformity.

Thresholds

Nematode populations above economic thresholds can significantly reduce yields. The economic threshold for nematode populations refers to the population at planting. Planting a susceptible crop in soils with a population of nematodes near or above the economic threshold will result in crop losses over time. For economic thresholds, see Table 7–1. *Nematode Thresholds for Fruit Crops*, on this page.

Table 7–1. Nematode Thresholds for Fruit Crops

Type of Nematode	Economic Threshold (nematodes/kg soil)
Root-lesion	1,000 (exception: 500 on strawberries)
Root-knot	1,000
Pin	5,000
Dagger	100
Bulb and stem	100

- Nematode problems are most often found in sandy-loam and sandy soils. Always sample these soils for nematode populations before planting fruit crops.
- Root-lesion and root-knot nematode problems are not usually found in clay or clay-loam soils. Sample these soils for nematodes before planting in replant sites or where susceptible crops have been recently grown.
- Sample clay or clay-loam soils for dagger nematode before planting on virus-susceptible grape, raspberry or tree fruit.

For more information, see OMAFRA Factsheet, *Sampling Soil and Roots for Plant Parasitic Nematodes*. Information on how to sample soil for nematodes and where to send the samples can be found in Appendix F: *Diagnostic Services*, page 436.

Nematode Management

Nematode management starts a year before planting a susceptible crop like fruit trees. Try to reduce nematode populations so that clean stock can establish well before the nematodes rebound to damaging levels. Young plants tolerate much less nematode feeding than established plants. Use a combination of the following methods to manage nematodes:

- Start new fields with transplants free from nematodes, and grown by an accredited plant propagator.
- Rotate susceptible crops with non-host crops for several years.
- Grow nematode-suppressing cover crops in the years prior to establishing fruit crops.
- Destroy residual crop roots.
- Plant resistant fruit cultivars where available.
- Control weeds, as they are good hosts of nematodes.
- Use soil fumigation before planting when nematode populations in soil reach or exceed thresholds (see Table 7–1. *Nematode Thresholds for Fruit Crops*, page 387).

Cover Crops for Nematode Suppression

Cover crops may reduce populations of plant parasitic nematodes when properly managed in the year before planting. In Ontario, these nematode-suppressing cover crops have been successful:

- oilseed radish
- certain white and oriental mustard cultivars like White Gold, Pacific Gold, Caliente, Cutlass or Forge
- specific sorghum × sudan-grass hybrids
- African marigold cultivars like Crackerjack or Creole
- Canadian Forage Pearl Millet 101 (root lesion nematode suppression)

Not all cultivars of the above cover crops reduce nematode populations. Choose the right variety. One or more years of nematode-suppressing cover crops may be required to reduce nematodes below economic thresholds.

Cover crops suppress nematodes in different ways:

- Canadian Forage Pearl Millet 101 is a poor host and inhibits the ability of root lesion nematodes to reproduce in its root-system.
- Certain cultivars of African marigolds produce a root exudate that is toxic to nematodes in the soil.
- Nematode-suppressing cultivars of oilseed radish and certain white and oriental mustards produce glucosinolates and an enzyme in their leaves, stems and petioles. The enzyme converts the glucosinolates into isothiocyanates, which are toxic to nematodes when the cover crop is cut green and incorporated immediately into the soil.

Exclude cover crops such as clovers and buckwheat from berry and orchard rotations. These are excellent hosts for root-lesion nematodes. Wheat or barley are the best cereal crops to grow before planting.

For more information, visit ontario.ca/crops and search the *Soil Management, Fertilizer Use, Crop Nutrition and Cover Crops for Fruit Production* webpage.

Other Cultural Practices to Reduce Nematodes

Nematode populations can build on many weed species. A good weed control program is essential the year before planting fruit crops. Plan an intensive weed management strategy for the cover crop where nematode-suppressing cover crops are grown.

Keep land fallow the year before planting to reduce nematode numbers. A disadvantage to fallow land is increased susceptibility to soil erosion. In orchards, choose ground covers for planting between the rows that do not support nematodes, such as annual or perennial ryegrass, or creeping red fescue.

Soil Fumigation

Pre-plant soil fumigation is the most effective method of controlling nematode problems. Fumigants can be broadcast over the whole field or applied only in bands where crop will be planted. Tree-row application, or the treatment of a 2.0–2.5 m strip centred on the row, is more economical, but requires good planning. However, broadcast fumigation will reduce the risk of re-contamination if non-fumigated soil is mixed into the fumigated strip.

For products, rates and other information on fumigants, refer to Table 7–2. *Products for Management of Nematodes and Other Soil-borne Pests*, page 390.

Application of fumigants before planting

Most fumigants are applied by shank injection using specialized application equipment. Some formulations of metam sodium can be applied to the soil surface and watered in. See the product label for application instructions.

- Fumigate when soil temperatures are above 4°C at 20 cm depth. Warmer temperatures (15°C and over) are preferred for more rapid fumigant dispersal in the soil. Fumigation in the early fall before planting is best for fruit crops which are planted in early spring when soils are still cool.
- Land preparation is critical for effective fumigant application. Fumigants cannot easily penetrate large clumps of soil and organic matter. Remove trash and old root systems. One week prior to fumigation, work the soil to a depth of 25–30 cm and obtain good seedbed tilth and moisture. Keep soil moist and if necessary irrigate the treated area during the week prior to fumigation.

A light cultivation immediately before fumigation may be necessary if a soil crust has developed.

- Soil moisture in the top 15–20 cm must be at the level stipulated by the fumigant label prior to and during fumigation. If soil moisture is not sufficient, it must be adjusted before product application can occur. For best results, keep the soil surface moist during application and for 24 hours after application.
- Seal the soil surface immediately after injection of the fumigant. The best method for sealing the soil is covering it with tarps, however, rolling or cultipacking immediately behind the fumigant applicator can also be used. Some fumigants have specific requirements for sealing the soil—consult product labels to determine what is legally permissible for the fumigant and type of application. Light watering after application will further prevent the escape of fumigant from the soil.
- Leave soil undisturbed for at least 1 week after injection of the fumigant. Colder soils (below 15°C) require longer periods from injection to aeration.
- Work the soil and aerate for about a week before planting. For fall planting, work the soil and aerate for 2 weeks before planting. The time interval between fumigation and planting into fumigated soil depends upon the product used, the rate and the temperature following fumigation (consult product label).
- Use high-quality planting stock, preferably grown in fumigated soil. Nursery operators can provide information on how to manage nematodes.
- Always read the product label. All fumigant labels now contain detailed Good Agricultural Practices for soil conditions, sealing, application and re-entry. These are mandatory and must be followed for all fumigant applications.

Fumigating single-tree sites before planting replacement trees

When trees are replanted within an existing orchard, nematodes and diseases can be controlled in the planting hole using Vapam or Busan before planting. Refer to the product label for application details, rates and safety precautions.

Table 7–2. Products for Management of Nematodes and Other Soil-borne Pests

CAUTION: These products are very toxic. Read the label and follow instructions for handling and application. Always follow manufacturer's directions carefully for dosage and methods of use. The applicator must wear suitable protective clothing, etc. These requirements vary between products and can be found on the label.

Product	Active Ingredient	Ontario Class	Pests Controlled ¹			Fruit Crop Registrations	Rates (shank injection or surface applied)	Rates (sprinkler application)
			Nematodes	Soil-borne Diseases	Weeds			
Busan 1020	metam sodium 33%	4	yes	yes	yes	fruit crops	375–935 L/ha (shank injection)	700–935 L/ha
Busan 1180	metam potassium 54%	3	yes	yes	yes	fruit crops	231–576 L/ha (shank injection)	431–576 L/ha
Busan 1236	metam sodium 42%	4	yes	yes	yes	fruit crops	274–683 L/ha (shank injection)	511–683 L/ha
Chloropicrin 100	chloropicrin 99%	2	yes	yes	no	strawberry, raspberry	93 L/ha ² (shank injection)	do not apply with sprinklers
Enfuse M 510	metam sodium 42%	4	yes	yes	yes	fruit crops	260 L/ha (surface applied)	do not apply with sprinklers
Pic Plus	chloropicrin 85.1%	2	yes ³	yes	no	strawberry, raspberry	108 L/ha ⁴ (shank injection)	do not apply with sprinklers
MustGrow	oriental mustard seed meal 100%	3	yes ⁵	yes ⁵	no	strawberry, raspberry tree fruit, tree nuts	1121–2240 kg/ha (surface applied)	do not apply with sprinklers
Vapam HL	metam sodium 42%	4	yes	yes	yes	fruit crops	279–696 L/ha (shank injection)	350–670 L/ha
Velum Prime	fluopyram (500 g/L)	2	yes ⁶	yes ⁷	no	strawberry, specialty bushberry ⁸	do not surface apply	500 mL/ha (chemigation) ⁹

¹ See label for exact registrations.

² Use 140 L/ha Chloropicrin 100 for strawberry plant production (runner production).

³ Pic Plus is labelled for root-knot nematode but is not labelled for root-lesion nematode.

⁴ Use 162 L/ha PicPlus for strawberry plant production (runner production).

⁵ Provides suppression rather than control.

⁶ Provides suppression of soil-dwelling, root feeding nematodes (juveniles, adults).

⁷ Provides control of foliar disease (powdery mildew).

⁸ Low-bush blueberry, bearberry, bilberry, cloudberry, cranberry, lingonberry, muntries, partridgeberry.

⁹ Chemigation into the root-zone through low pressure drip, trickle, micro-sprinkler or equivalent equipment.

New requirements for fumigants

Health Canada's Pest Management Regulatory Agency (PMRA) has changed the label requirements for soil fumigant products containing chloropicrin, metam sodium and metam potassium. These requirements are intended to further limit user exposure and increase protection of workers, bystanders and the environment. The changes took effect in September 2014. Growers and applicators should ensure they have the most current version of product labels before applying any fumigant. Detailed instructions can be found on product labels, but requirements include:

- A Fumigation Management Plan (FMP) must be completed prior to the start of any fumigant application. This is an organized, written description of the steps involved to ensure a safe and effective fumigation. The specific requirements for the FMP will be listed on the product label.
- Mandatory Good Agricultural Practices are now required. This standardizes many practices already on existing labels and helps improve the safety and efficacy of soil fumigations. These practices will vary with the product and application method but will include identifying optimal weather conditions, proper soil preparation, requirements for soil moisture and temperature, methods for soil sealing and use of proper application depths.
- DO NOT apply these products when a temperature inversion is occurring or is predicted to occur within 48 hours after application is complete, as fumigant vapours may drift. For more information on how inversions affect drift of pest control products, see www.sprayers101.com/surface-inversions/.
- DO NOT apply these products if light wind conditions (less than 3 km/h) are forecast to persist for more than 18 consecutive hours from the time the application starts until 48 hours after the application is complete. Calm conditions could indicate a temperature inversion, which could lead to spray drift. See www.sprayers101.com for more information on temperature inversions.
- Any person involved in the use of fumigants is considered a fumigant handler. All fumigant handlers must hold an appropriate pesticide applicator certificate or license recognized by the provincial pesticide regulatory agency where the pesticide application is to occur.
- Entry into fumigant application blocks by any person (other than fumigant handlers, emergency personnel and local, provincial or federal officials performing inspection, sampling or other official duties) is PROHIBITED during the Application Block Period.

- The Application Block Period begins at the start of application and expires at least 5 days after the application is complete. The length of the period will depend on application criteria (e.g., tarped or non-tarped, etc.). The applicator must verbally warn workers of the application.
- Fumigant application signs must be posted on all entrances to the application block. Signs must be posted prior to the start of the application (but no earlier than 24 hours prior to application) and remain posted for the duration of the Application Block Period. Signs must be removed within 3 days of the end of the Application Block Period.
- Only fumigant handlers with an appropriate pesticide applicator certificate or license recognized by the provincial regulatory agency may be in the application block from the start of the application until the Application Block Period expires, and in the buffer zone during the Buffer Zone Period.

Buffer zones

- A buffer zone must be established for all fumigant applications. A buffer zone is an area around the perimeter of the fumigated area that extends equally in all directions. The size of the buffer zone area will depend on the product and application criteria.
- Only fumigant handlers with appropriate certification may enter the buffer zone during the Buffer Zone Period, the 48-hour period following application. All non-handlers, including field workers, residents and pedestrians must be excluded from the buffer zone during the Buffer Zone Period, except for transit (e.g., vehicular or bicycle traffic).
- The size of the buffer zone will vary with application method, rate and field size. Product labels will include tables to determine the required buffer zone distance.
- Buffer zones cannot include any residential area or occupied building, outdoor residential areas (e.g., lawns, gardens, play areas) or other areas that may be occupied during the 48-hour period following application.
- An emergency preparedness plan will be required when residences or businesses are located in close proximity to the outer edge of the buffer zone.

Nematode Suppression After Planting

Velum Prime

Velum Prime is a broad-spectrum nematicide/fungicide (Fungicide Group 7) with preventative, systemic, and curative properties for the suppression of certain soil plant pathogenic nematodes and control of certain crop diseases. Velum Prime is best suited for use in a preventative treatment program. For best results, this product should be applied in the root zone through drip irrigation equipment only beginning at planting. As the roots take up the product, it suppresses root feeding nematodes and moves up into the foliar plant tissue to control certain fungal diseases such as powdery mildew.

- To limit the potential for disease resistance developing to Group 7 fungicides, do not make more than 2 sequential applications of Velum Prime or any other Group 7 product before rotating to a different fungicide group registered for the same use.
- Fungicides other than Group 7 with a different mode of action should be applied for the first foliar fungicide application.
- Do not apply more than 1 litre of Velum Prime/ha per year, regardless of formulation or method of application.
- Velum Prime can be applied up to the day of harvest.

Vydate

Vydate will suppress nematodes after planting non-bearing apples and raspberries. Vydate is less effective than pre-plant soil fumigation and does not control soil-borne disease. Refer to the product label for application methods, mixing instructions, rates and precautions.

- Vydate is highly toxic to bees. Do not apply during the pink or bloom period.
- Vydate is very toxic to humans. Follow application instructions closely.

Apple-specific strategies:

- Treat young whips and non-bearing fruit trees with 1 application of Vydate as a soil drench around the base of each tree when roots are actively growing and leaf growth begins in the spring. Follow this with a foliar application of Vydate.
- An alternative method is to make 3 foliar applications on a 2–3-week schedule for a total of 3 applications.
- Do not allow spray to drift onto trees in bloom.
- Do not apply to trees under water stress or not actively growing.
- Do not re-enter treated fields for 24 hours after application.

Raspberry-specific strategies:

- Treat raspberry plants with 1 application of Vydate as a soil drench over roots in the fall before October 31. Do not apply Vydate to raspberries in the spring.
- Do not apply to raspberries more than once a year.
- Do not re-enter treated fields for 12 hours after application.

8. Managing Pest Resistance

Pest Resistance to Fungicides, Insecticides and Miticides

Random natural mutation may result in a small proportion of a population that is resistant to a particular chemical, or group of chemicals, with similar modes of action. When a population is exposed to a pesticide, the resistant individuals survive and the susceptible individuals are killed. The resistant survivors then multiply and pass their resistant traits on to the next generation. When the same pesticide is applied again, the proportion of resistant individuals increases, replacing the susceptible ones in the population. Once the resistant population dominates, the pesticide has lost efficacy. A pest population is considered resistant when it is able to survive exposure to rates of a pesticide that previously controlled it.

Resistance to one pesticide can result in resistance to a different pesticide or a group of pesticides, where pesticides have similar action sites. This is called **cross-resistance**. It develops when exposure to one pesticide causes selection for resistance in other related ones and is the result of a single mechanism or genetic mutation.

Multiple resistance involves 2 or more mechanisms acquired independently through exposure to pesticides with different action sites. Pests with multiple resistance are resistant to pesticides from 2 or more groups at the same time.

Multiple resistance and cross-resistance create serious challenges to the success of integrated resistance management strategies.

Pest control failures are not necessarily caused by resistance. Factors such as product selection, timing, rate, spray coverage, spray water pH and weather conditions also affect the success or failure of a pesticide application.

Assessing Resistance Risk

The development of resistance depends on characteristics of both the pest and the group of pesticides involved, as well as the way in which pesticides are used. Table 8–1. *Factors Favouring the Development of Resistance*, page 394, describes situations where resistance is most likely to occur.

Resistance can develop very quickly for some pesticides. If a product is prone to resistance, do not use the product repeatedly unless it is used in rotation or in combination with products from a different group.

Resistance Management Strategies

Resistance management strategies include rotating products from different groups and limiting the total number of applications from a single group within a growing season. Specific knowledge is required for growers to manage resistance effectively.

General Resistance Management Strategies

- Follow an integrated pest management program that makes use of a variety of different pest control strategies, including resistant varieties when available, monitoring, crop rotation and cultural, biological and chemical control options.
- Do not use pesticides at levels below label rates.
- Use adequate water volumes to deliver the pesticide to all tissues.
- Spray only when necessary. Use established thresholds where available.
- Spray at the best timing for the pest and the product you are using.
- Make each spray application count. Be sure the sprayer is calibrated, the correct rate is applied and spray coverage is complete.
- Read the product label. New products include resistance management recommendations on the label.
- Know the active ingredient of a pesticide. Many chemicals with the same active ingredients are marketed under different brand names. For example, the insecticide permethrin is marketed under the brand names Ambush, Perm-Up and Pounce.
- Know the product group. Choose products from different groups when possible in your spray rotation. For example, both Assail and Admire are in the same insecticide group (Group 4A). To use Assail after Admire is equivalent to using Assail after Assail, since resistance to both chemicals develops in the same way.

- For a list of groups and their modes of action, see Table 8–2. *Fungicide/Bactericide Groups*, page 398 and Table 8–3. *Insecticide/Miticicide Groups*, page 404, or the “Products Used On” tables at the end of each crop calendar.
- In addition to these general *resistance management strategies* for all products, more specific strategies have been developed for fungicides, insecticides and miticides.

Table 8–1. Factors Favouring the Development of Resistance

Pests most likely to develop resistance	Pesticides or use patterns where resistance is likely to develop
• have a prolific life cycle, with many generations per year, produce lots of spores, or multiply very quickly • have a pre-existing resistance to other products in the same group • do not migrate between crops/regions, so gene pool is not diluted	• are used repeatedly or have persistent residues, exposing many generations or life stages to these residues • are toxic to beneficial insects as well as the pest • have a specific mode of action that works on a single site • are used at deficient rates or improper times

Managing Resistance to Fungicides

- Know the fungicide groups. Over a season, choose fungicides from different groups whenever possible.
- Limit the total number of applications, and the number of sequential applications, of a particular fungicide group per season. Look for specific resistance management strategies on the product label.
- Know which disease is targeted by which fungicide group. For combination products, know which fungicide component is controlling which disease. For example, Pristine is a combination of boscalid (Group 7) and pyraclostrobin (Group 11). In most registered crops, the labelled rate of boscalid is strong against botrytis grey mould, and pyraclostrobin is effective against powdery mildew and anthracnose. Alternating Pristine with other fungicides in Group 7 is not effective for resistance management of botrytis.

- Apply fungicides before disease occurs. Applications of fungicides after the disease is established are more likely to select for resistant populations of the pathogen.
- Make use of Group M fungicides. These fungicides are known as multi-site inhibitors (Table 8–2. *Fungicide/Bactericide Groups*, page 398). They affect a wide range of metabolic processes in fungi and are less prone to the development of resistance. While there is no significant risk of resistance development, integrated resistance management should still be applied. For example, bacteria causing fire blight or blister spot can develop resistance to copper products.
- Tank-mix products from different groups. Wherever possible, one of the tank-mix partners should be a fungicide from Group M, with a multi-site mode of action (This is an accepted resistance management strategy for fungicides, although not recommended for insecticides.).

Resistance management strategies by fungicide group and disease for Ontario fruit crops

Resistance management strategies are important for diseases like botrytis, powdery mildew, downy mildew, anthracnose, brown rot and apple scab because these pathogens have characteristics which favour the development of resistance (see Table 8–1. *Factors Favouring the Development of Resistance*, on this page).

The suggested strategies for preventing fungicide resistance were developed using the recommendations of the Fungicide Resistance Action Committee (FRAC), which is a working group of Crop Life International. They were then adapted specifically for Ontario based on:

- the resistance risk of the pathogen to a particular fungicide group
- the number of rotational options registered for use at the time
- Two components of a resistance management strategy for a fungicide group are limiting the number of consecutive applications before rotating to a different group and observing a maximum number of applications per season. These strategies reduce the risk for resistance development and may be more stringent than label guidelines.

- For high-risk pathogens with fungicide options from many groups, rotation to a different group is advisable after a single application of a resistance-prone fungicide, although this is not necessarily required by the label.
- For pathogens controlled by only a few registered fungicide groups, use no more than 2 consecutive applications of a resistance-prone fungicide and then alternate to a different fungicide group.

When a product contains active ingredients from more than one group, each application counts as a use for each group. For example, one application of Pristine counts as a single use of boscalid (Group 7) and a single use of pyraclostrobin (Group 11).

In some cases, a single fungicide group can control more than one pathogen. In this case, the maximum number of consecutive and total applications per season should be based on the pathogen with the highest risk of developing resistance.

Solo products have one active ingredient. Combination products have more than one active ingredient and are indicated with an asterisk (*).

Group 1: Senator

- **Apple** – For apple scab, tank-mix with a Group M fungicide. Historically, Benlate-resistant forms of apple scab have been confirmed in Ontario. Senator belongs to the same chemical group. Avoid using this product if Benlate was used in the past.
- **Berry** – For botrytis grey mould and common leaf spot, tank-mix with a Group M fungicide.

Group 3: Aprovia Top *, Bumper, Fitness, Fullback, Funginex, Indar, Inspire Super *, Jade, Mettle, Nova, Proline, Tilt, Quash, Quilt

- **Apple** – For apple scab and powdery mildew, tank-mix with a Group M fungicide. Use once then rotate to a different fungicide group. Use fungicides from this group no more than 2 times per season as a solo or mixture product. Resistance to Nova has been confirmed in apple scab populations in Ontario. Avoid using these products in orchards with resistance.

- **Berry crops** – For powdery mildew, use no more than 2 consecutive applications then rotate to a different fungicide group. Use fungicides from this group no more than 4 times per season.

For mummy berry, tank-mix with a Group M fungicide. Use no more than 2 consecutive applications then rotate to a different fungicide group.

- **Grape** – For powdery mildew, use once then rotate to a different fungicide group. Use fungicides from this group no more than 2 times per season as a solo or mixture product.
- **Stone fruit** – For brown rot, use once then rotate to a different fungicide group. Use fungicides from this group no more than 2 times per season as a solo or mixture product.

Group 5: Priwen

- **Grape** – For powdery mildew, use once then rotate to a different fungicide group. Use fungicides from this group no more than 2 times per season.

Group 7: Aprovia Top *, Cantus, Fontelis, Kenja, Luna Tranquility *, Pristine *, Sercadis

- **Apple** – For apple scab and powdery mildew, tank mix with a Group M fungicide. Use once then rotate to a different fungicide group. See Group 11 for recommendation for Pristine use.
- **Berry crops** – For botrytis grey mould, use once then rotate to a different fungicide group. No more than 30% of total fungicides applied per season should include a solo or mixture product from this group. See Group 11 for recommendations for Pristine use.
- **Grape** – For powdery mildew and botrytis bunch rot, use once then rotate to a different fungicide group. Use fungicides from this group no more than 2 times per season as a solo or mixture product.
- **Stone fruit** – For brown rot, use once then rotate to a different fungicide group. Use fungicides from this group no more than 2 times per season as a solo or mixture product.

Group 9: Inspire Super *, Luna Tranquility *, Scala, Switch *

- **Apple, pear** – For scab, use once then rotate to a different fungicide group. Use fungicides from this group prebloom only and no more than 2 times per season as a solo or mixture product.
- **Berry crops** – For botrytis grey mould and anthracnose, use once then rotate to a different fungicide group. No more than 30% of total fungicides applied per season should include a solo or mixture product from this group.
- **Grape** – For powdery mildew and botrytis bunch rot, use once then rotate to a different fungicide group. Use fungicides from this group no more than 2 times per season as a solo or mixture product.
- **Stone fruit** – For brown rot, use once then rotate to a different fungicide group. Use solo fungicides (Scala) from this group no more than 2 times per season and co-formulations (Inspire Super, Luna Tranquility, Switch) no more than 3 times per season.

Group 11: Cabrio, Flint, Intuity, Pristine *, Quadris, Quilt *, Sovran, Tanos *

- **Apple, pear** – For scab and powdery mildew, tank-mix with a Group M fungicide. Use once then rotate to a different fungicide group. Use fungicides from this group no more than 3 times per season as a solo or mixture product. Resistance to Flint, Sovran and Pristine have been confirmed in apple scab populations in Ontario. Avoid using these products in orchards with resistance.
- **Berry crops** – For botrytis grey mould, use once then rotate to a different fungicide group. No more than 30% of total fungicides applied per season should include a solo product from this group or no more than 50% of total fungicides applied per season if using combination products.

For anthracnose fruit rot, tank-mix with a Group M fungicide to expand the spectrum of disease control. Use once then rotate to a different fungicide group. Resistance to Cabrio has recently been confirmed in strawberry anthracnose fruit rot populations in Ontario.

Avoid using these products in strawberries with resistance.

- **Grape** – For powdery mildew and downy mildew, use once then rotate to a different fungicide group. Use fungicides from this group no more than 2 times per season as a solo or mixture product.
- **Stone fruit** – For brown rot, use once then rotate to a different fungicide group. Use fungicides from this group no more than 2 times per season as a solo or mixture product.

Group 12: Scholar, Switch *

- **Apple and pear** – For storage rots, do not make more than 1 postharvest application of Scholar.
- **Berry crops** – For botrytis grey mould and strawberry anthracnose fruit rot, use no more than 2 consecutive applications of Switch then rotate to a different fungicide group. No more than 50% of total fungicides applied per season should include a product from this group.
- **Grape** – For botrytis bunch rot, use once then rotate to a different fungicide group. Use fungicides from this group no more than 2 times per season.

Group 13: Quintec

- **Strawberry** – For powdery mildew, use no more than 2 consecutive applications then rotate to a different fungicide group. No more than 50% of total fungicides applied per season should include a product from this group.
- **Grape** – For powdery mildew, use once then rotate to a different fungicide group. Use no more than 2 times per season.
- **Stone fruit** – For powdery mildew, use once then rotate to a different fungicide group. Use no more than 2 times per season.

Group 17: Elevate

- **Berry crops** – For botrytis grey mould, use once then rotate to a different fungicide group. Use no more than 2 times per season.
- **Grape** – For botrytis bunch rot, use once then rotate to a different fungicide group. Use no more than 2 times per season.
- **Stone fruit** – For brown rot, use once then rotate to a different fungicide group. Use no more than 2 times per season.

Group 33: Aliette, Confine Extra, Phostrol, Rampart

- **Grape** – For downy mildew, use once then rotate to a different fungicide group. Use fungicides from this group no more than 3 times per season.

Group 40: Forum, Revus, Zampro *

- **Grape** – For downy mildew, use once then rotate to a different fungicide group. Use Revus or Forum no more than 2 times per season and Zampro no more than 3 times per season.

Group 45: Zampro *

- **Grape** – For downy mildew, use once then rotate to a different fungicide group. Use no more than 3 times per season.

Group U8: Vivando

- **Grape** – For powdery mildew, use once then rotate to a different fungicide group. Use no more than 2 times per season.

Group U12: Equal, Syllit

- **Apple, pear** – For scab, tank mix with a Group M fungicide. Use fungicides from this group prebloom only and no more than once per season as a solo or mixture product. Resistance to Syllit has been confirmed in apple scab populations in Ontario. Avoid using these products in orchards with resistance.
- **Stone fruit** – For cherry leaf spot, use once then rotate to a different fungicide group. Use no more than once per season.

Table 8–2. Fungicide/Bactericide Groups

Group	Chemical Group	Product Name	Active Ingredient ¹	Resistance Risk ²
1	MBC (methyl benzimidazole carbamates)	Mertect SC	thiabendazole	High
		Senator 50 SC	thiophanate-methyl	High
2	Dicarboximides	Rovral WP	iprodione	High
3	DMI (demethylation inhibitors) Note: sometimes loosely known as sterol inhibitors (SI)	Aprovia Top 195 EC	difenoconazole * + benzovindiflupyr	Medium
		Bumper 432 EC	propiconazole	Medium
		Fullback 125 SC	flutriafol	Medium
		Fitness	propiconazole	Medium
		Funginex DC	triforine	Medium
		Indar	fenbuconazole	Medium
		Inspire Super	difenoconazole * + cyprodinil	Medium
		Jade	propiconazole	Medium
		Mettle 125 ME	tetraconazole	Medium
		Nova	myclobutanil	Medium
		Proline 480 SC	prothioconazole	Medium
		Quash	metconazole	Medium
		Quilt	propiconazole * + azoxystrobin	Medium
		Tilt 250 E	propiconazole	Medium
4	PA (phenylamides)	Ridomil Gold MZ 68 WG	metalaxyl * + mancozeb	Low
		Ridomil Gold 480 SL	metalaxyl	High
5	Amines (morpholines)	Priwen	spiroxamine	Low – Medium
7	SDHI (succinate dehydrogenase inhibitors)	Aprovia Top 195 EC	difenoconazole + benzovindiflupyr *	Medium
		Cantus WDG	boscalid	Medium – High
		Fontelis	penthioopyrad	Medium – High
		Kenja 400 SC	isofetamid	Medium – High
		Luna Tranquility	fluopyram * + pyrimethanil	Medium
		Pristine WG	boscalid * + pyraclostrobin	Medium
		Sercadis	fluxapyroxad	Medium – High

M = Multi-site fungicides. NC = Not classified by FRAC, or group not indicated on product label. P = Plant extract. U = Mode of action has not been determined.

¹ Indicates the active ingredient (a.i.) that puts it in this group.

² According to Fungicide Resistance Action Committee (FRAC) http://www.frac.info/docs/default-source/publications/frac-code-list/frac-code-list-2018-final.pdf?sfvrsn=6144b9a_2

Table 8–2. Fungicide/Bactericide Groups (cont'd)

Group	Chemical Group	Product Name	Active Ingredient ¹	Resistance Risk ²
9	AP (anilinopyrimidines)	Inspire Super	difenoconazole + cyprodinil *	Low
		Luna Tranquility	fluopyram + pyrimethanil *	Medium
		Scala SC	pyrimethanil	Medium
		Switch 62.5 WG	cyprodinil * + fludioxonil	Low
11	QoI (quinone outside inhibitors) Note: strobilurins belong in this group, but not all QoI are strobilurins	Cabrio EG	pyraclostrobin	High
		Flint	trifloxystrobin	High
		Intuity	mandestrobin	High
		Pristine WG	boscalid + pyraclostrobin *	Low – Medium
		Quadris Flowable	azoxystrobin	High
		Quilt	propiconazole + azoxystrobin *	Medium
		Sovran	kresoxim-methyl	High
		Tanos 50 DF	cymoxanil + famoxadone *	Medium
12	PP (phenylpyrroles)	Scholar 230 SC	fludioxonil	Medium
		Switch 62.5 WG	cyprodinil + fludioxonil *	Medium
13	Aza naphthalenes	Quintec	quinoxifen	Medium
17	Hydroxyanilide	Elevate 50 WDG	fenhexamid	Unknown
21	Qil (quinone inside inhibitors)	Torrent 400 SC	cyazofamid	Medium – High
22	B3 Benzamide	Gavel 75 DF	mancozeb + zoxamide *	Low
24	Antibiotic	Kasumin 2L	kasugamycin	Medium
25	Antibiotic	Streptomycin 17	streptomycin	High
27	Cyanoacetamide oxime	Tanos 50 DF	cymoxanil * + famoxadone	Low – Medium
29	2,6-dinitroaniline	Allegro 500 F	fluazinam	Low
33	Phosphonate	Aliette WDG	fosetyl al	Low
		Confine Extra	mono- and dipotassium salts of phosphorous acid	Low
		Phostrol	mono- and dibasic sodium, potassium and ammonium phosphites	Low
		Rampart	mono- and dipotassium salts of phosphorous acid	Low

M = Multi-site fungicides. NC = Not classified by FRAC, or group not indicated on product label. P = Plant extract. U = Mode of action has not been determined.

¹ Indicates the active ingredient (a.i.) that puts it in this group.

² According to Fungicide Resistance Action Committee (FRAC) http://www.frac.info/docs/default-source/publications/frac-code-list/frac-code-list-2018-final.pdf?sfvrsn=6144b9a_2

Table 8–2. Fungicide/Bactericide Groups (cont'd)

Group	Chemical Group	Product Name	Active Ingredient ¹	Resistance Risk ²
40	CAA (carboxylic acid amides)	Forum	dimethomorph	Low – Medium
		Revus	mandipropamid	Low – Medium
		Zampro	dimethomorph * + ametoctradin	Medium
44	Microbial	Double Nickel LC	<i>Bacillus amyloliquefaciens</i> strain D-747	Low
		Serenade OPTI	<i>Bacillus subtilis</i> strain QST 713	Low
45	QxI (quinone x inhibitor)	Zampro	dimethomorph + ametoctradin *	Medium
46	Cell membrane disruption	Timorex Gold	tea tree oil	Low
M1	Inorganic	Copper 53 W	tri-basic copper sulphate	Low (except bacterial pathogens)
		Guardsman Copper Oxychloride 50	copper oxychloride	Low (except bacterial pathogens)
		Copper Spray	copper oxychloride	Low (except bacterial pathogens)
		Cueva	copper octanoate	Low (except bacterial pathogens)
		Kocide 2000	copper hydroxide	Low (except bacterial pathogens)
M2	Inorganic	Cosavet Edge DF	sulphur	Low
		Kumulus DF	sulphur	Low
		Lime Sulphur	lime sulphur	Low
		Microscopic Sulphur WP	sulphur	Low
		Microthiol Disperss	sulphur	Low
M3	Dithiocarbamate	Dithane Rainshield	mancozeb	Low
		Ferbam WDG	ferbam	Low
		Gavel 75 DF	mancozeb * + zoxamide	Low
		Granuflo T	thiram	Low
		Manzate Pro-Stick	mancozeb	Low
		Penncozeb 75 DF Raincoat	mancozeb	Low
		Polyram DF	metiram	Low
		Ridomil Gold MZ 68 WG	metalaxyl + mancozeb *	Low
M4	Phthalimide	Folpan 80 WDG	folpet	Low
		Maestro 80 DF	captan	Low
		Supra Captan 80 WDG	captan	Low

M = Multi-site fungicides. NC = Not classified by FRAC, or group not indicated on product label. P = Plant extract. U = Mode of action has not been determined.

¹ Indicates the active ingredient (a.i.) that puts it in this group.

² According to Fungicide Resistance Action Committee (FRAC) http://www.frac.info/docs/default-source/publications/frac-code-list/frac-code-list-2018-final.pdf?sfvrsn=6144b9a_2

Table 8–2. Fungicide/Bactericide Groups (cont'd)

Group	Chemical Group	Product Name	Active Ingredient ¹	Resistance Risk ²
M5	Chloronitrile	Bravo ZN	chlorothalonil	Low
		Echo 90 DF	chlorothalonil	Low
M12	Polypeptide	Fracture	BLAD polypeptide	Low
NC	Biological	Actinovate SP	<i>Streptomyces lydicus</i>	Low
		Bio-Save 10 LP	<i>Pseudomonas syringae</i>	Low
		Blossom Protect	<i>Aureobasidium pullulans</i>	Low
		Botector	<i>Aureobasidium pullulans</i>	Low
NC	Bicarbonate	MilStop	potassium bicarbonate	Low
		Sirocco	potassium bicarbonate	Low
NC	Oil	Purespray Green Spray Oil 13 E	mineral oil	Low
		Vegol Crop Oil	canola oil	Low
NC	Not classified	Buran	garlic powder	Low
P5	Plant extract	Regalia Maxx	<i>Reynoutria sachalinensis</i> extract	Unknown
U8	Benzophenone	Vivando SC	metrafenone	Medium
		Property 300 SC	pyriofenone	Medium
U12	Guanidines	Equal	dodine	Low – Medium
		Syllit 400 FL	dodine	Low – Medium

M = Multi-site fungicides. NC = Not classified by FRAC, or group not indicated on product label. P = Plant extract. U = Mode of action has not been determined.

¹ Indicates the active ingredient (a.i.) that puts it in this group.

² According to Fungicide Resistance Action Committee (FRAC) http://www.frac.info/docs/default-source/publications/frac-code-list/frac-code-list-2018-final.pdf?sfvrsn=6144b9a_2

Managing Resistance to Insecticides and Miticides

- Know the insecticide groups. Rotate products from different groups. Avoid sequential applications of the same group or repeated use of any insecticide or group of insecticides.
- For insects with multiple, discrete generations (e.g., oriental fruit moth, codling moth, grape berry moth), manage each generation as separate units or “treatment windows”. Use products from a single insecticide group to manage a given generation of a pest. If the pest emergence or activity of that generation is prolonged, apply a second application of the same product. This exposes each generation to only one group. Rotate to another insecticide group (or groups) for subsequent generations.
- For pests whose populations build quickly and with multiple, overlapping generations (e.g., aphids, mites), rotate between products in different insecticide groups for each spray.
- Avoid unnecessary or repeated applications of miticides and rotate among products in different groups. Many labels limit the number of applications of a product to one per season. Consider a multi-year rotation of miticides, so that mites are not exposed to products with a similar mode of action more frequently than once every 3–4 years.
- Consider annual delayed dormant oil or summer oils to suppress mite, aphid or psylla populations and reduce the need for miticides when numbers exceed the treatment threshold(s).
- Time sprays to contact the most susceptible life stage of the pest. Consider the time of day when the pest is most active and location in the crop to maximize exposure with the treatment.
- Use mixtures with caution. Tank mixes and pre-formulated mixtures are pest management tools, not insecticide resistance management tools. Mixtures can provide a broader range of target pest control; however, their repeated use increases the probability that the target pest population(s) will develop multiple resistances. Alternating or rotating among products with one active ingredient, rather than mixing them, is the preferred strategy for insecticides and miticides in most situations.
- Consider the use of mating disruption where available and practical.
- Use regional or area-wide tactics rather than crop-by-pest management for cross-commodity pests, such as oriental fruit moth in stone and pome fruits.

- Encourage biological control by choosing pesticides less harmful to beneficial insects and by landscaping to provide flowering plants and unsprayed habitat for these natural enemies. This may reduce the need for insecticides or miticides, particularly those targeting indirect pests such as aphids and mites.
- Monitor problematic pests to detect shifts in sensitivity to a group of pesticides.

Resistance management strategies by insecticide group for Ontario fruit crops

Solo products have one active ingredient. Combination products have more than one active ingredient and are indicated with an asterisk (*).

Group 1A & 1B: Cygon, Diazinon, Imidan, Lagon, Lannate, Lorsban, Malathion, Orthene, Pyrinex, Sevin, Vydate, Warhawk

Resistance to these older, broad-spectrum insecticides has occurred in various fruit pest populations in Ontario. Documented cases include resistance to organophosphates in spotted tentiform leafminer and codling moth on apples, obliquebanded leafroller on apples and pears, pear psylla on pears, and oriental fruit moth on peaches, nectarines, pears and apples.

Repeated use (more than once per season) is discouraged because of the potential for further resistance development and toxicity to beneficial insects and mites.

Group 3: Ambush, Concept *, Decis, Mako, Matador, Perm-Up, Pounce, Pyganic, Silencer, Up-Cyde, Pyganic

Present status of spotted tentiform leafminer and pear psylla resistance is unknown given that resistance in these pests has not been monitored since the early 1990s. Previous studies demonstrate that spotted tentiform leafminer adults became resistant to all pyrethroids in many orchards in Ontario when exposed to repeated applications of these chemicals. Pear psylla resistance to pyrethroids has been documented in western North America and some pear orchards in the Niagara Peninsula. Resistance may occur in other parts of the province. Documented cases of resistance in populations of obliquebanded leafroller on apples have been found.

Repeated use (more than once per season) is discouraged because of the potential for further resistance development and toxicity to beneficial insects and mites.

**Group 4: 4A – Actara, Admire, Alias, Calypso, Clutch, Concept *;
4C – Closer, TwinGuard *; 4D – Sivanto Prime**

Documented cases of resistance to Calypso have been found in some codling moth populations in Ontario and Quebec. Compounds from these subgroups are structurally distinct, but share the same mode of action. The risk of cross-resistance between subgroups is considered low. However, where alternatives are available, rotate with other groups. If only Group 4 insecticides are registered against the pest but more than one subgroup is included, rotate between subgroups only if it is clear that cross-resistance does not exist in the target populations.

Group 5: Delegate, Entrust, GF-120, Success, TwinGuard *

Resistance in western flower thrips to this group is known in greenhouse crops and could also be present in outdoor crops.

Group 11: Bioprotec, Dipel, Foray

There are no documented cases of resistance in Ontario for fruit crops. Use the basic principles of resistance management to ensure that insecticides in these groups work well in the future.

Group 15: Rimon

There are no documented cases of resistance in Ontario for fruit crops. Use the basic principles of resistance management to ensure that insecticides in these groups work well in the future.

Group 18: Confirm, Intrepid

Documented cross-resistance between organophosphate insecticides and the growth regulators, Confirm and Intrepid, has been found in some obliquebanded leafroller and codling moth populations, respectively, in Ontario. Where resistance is suspected for obliquebanded leafroller or codling moth, do not use Group 18, 1A or 1B. Consult the Apple Calendar, Chapter 2, for the appropriate timing of these products.

Group 28: Altacor, Exirel

There are no documented cases of resistance in Ontario for fruit crops. Use the basic principles of resistance management to ensure that insecticides in these groups work well in the future.

Resistance management strategies by miticide group for Ontario fruit crops

Group 6: Agri-Mek

There are no documented cases of resistant mite populations in Ontario to this group. Use resistance management principles. Apply this product early before threshold numbers are reached.

Group 10: Apollo

Isolated cases of mite resistance to Apollo have been found in Ontario. Resistance has occurred where Apollo has been applied repeatedly in one season, or applied too late in the season. To delay resistance to Apollo, do not use Apollo every year. Apply Apollo when the mite population is synchronous and in the first summer-generation egg stage.

Group 20B, 21 & 25: Kanemite, Nexter Nealta

There are no documented cases of resistant mite populations in Ontario. Use resistance management principles.

Group 23: Envidor, Movento, Oberon

There are no documented cases of resistant mite populations in Ontario. Use resistance management principles. These products work slowly, so patient and careful monitoring is needed to assess the results.

Group UN: Acramite

There are no documented cases of resistant mite populations in Ontario. Use resistance management principles.

Table 8–3. Insecticide/Miticide Groups

Group	Type of Action	Chemical Sub-group or Exemplifying Active Ingredient	Product Name	Active Ingredient
1	nerve	1A ¹ Carbamates	Lannate Toss-N-Go	methomyl
			Sevin XLR	carbaryl
			Vydate L	oxamyl
		1B ¹ Organophosphates	Cygon 480-AG	dimethoate
			Diazinon 500 E	diazinon
			Imidan WP	phosmet
			Lagon 480 E	dimethoate
			Lorsban 50 W	chlorpyrifos
			Malathion 85 E	malathion
			Orthene 75% SP	acephate
			Pyrinex 480 EC	chlorpyrifos
			Warhawk 480 EC	chlorpyrifos
3	nerve	3A Pyrethroids Pyrethrins	Ambush 500 EC	permethrin
			Capture 240 EC	bifenthrin
			Concept	imidacloprid + deltamethrin *
			Decis 5 EC	deltamethrin
			Mako	cypermethrin
			Matador 120 EC	lambda-cyhalothrin
			Perm-Up EC	permethrin
			Pounce 384 EC	permethrin
			Pyganic EC 1.4 II	pyrethrins
			Silencer 120 EC	lambda-cyhalothrin
			Up-Cyde 2.5 EC	cypermethrin

NC = Not classified by IRAC, or group not indicated on product label. UN = Mode of action has not been determined.

¹ Indicates the active ingredient (a.i.) that puts it in this group.

² All members of Group 1 may not be cross-resistant, although they share the same primary target site and mode of action. For this reason, Group 1 is divided into sub-groups Group 1A and 1B, each with different mechanisms of resistance. Assume that cross-resistance exists between pesticides in each sub-group, but that rotation of pesticides between sub-groups is an acceptable part of a resistance management program.

³ Other resistance mechanisms that are not linked to site of action (i.e., enhanced metabolism) are common for this group of chemicals.

⁴ Although compounds in Groups 4A and 4C are thought to have the same target site, current evidence suggests the risk of metabolic cross-resistance between Groups 4A and 4C is low. If there are no other alternatives, then compounds from Groups 4A and 4C may be rotated.

Table 8–3. Insecticide/Miticide Groups (cont'd)

Group	Type of Action	Chemical Sub-group or Exemplifying Active Ingredient	Product Name	Active Ingredient
4	nerve	4A3 Neonicotinoids	Actara 25 WG	thiamethoxam
			Admire 240 Flowable	imidacloprid
			Alias 240 SC	imidacloprid
			Assail 70 WP	acetamiprid
			Calypso 480 SC	thiacloprid
			Clutch 50 WDG	clothianidin
			Concept	imidacloprid * + deltamethrin
		4C3 Sulfoxafimines	Closer	sulfoxaflor
			TwinGuard	sulfoxaflor * + spinetoram
5	nerve	4D Butenilides	Sivanto Prime	flupyradifurone
			Delegate	spinetoram
			Entrust	spinosad
			GF-120 Fruit Fly Bait	spinosad
			Success	spinosad
6	nerve and muscle	Avermectins	TwinGuard	sulfoxaflor + spinetoram *
			Agri-Mek SC	abamectin
11	disrupt midgut membrane	11A B.t. microbial (and the insecticidal proteins they produce)	Bioprotec CAF	<i>Bacillus thuringiensis var. kurstaki</i>
			Dipel 2X DF	<i>Bacillus thuringiensis var. kurstaki</i>
			Foray 48 BA	<i>Bacillus thuringiensis var. kurstaki</i>
15	growth regulation	Benzoylureas	Rimon 10 EC	novaluron
10	growth regulation	10A Clofentazine	Apollo SC	clofentazine
18	growth regulation	Diacylhydrazine	Confirm 240 F	tebufenozide
			Intrepid 240 F	methoxyfenozide
20	energy metabolism	20B Acequinocyl	Kanemite 15 SC	acequinocyl

NC = Not classified by IRAC, or group not indicated on product label. UN = Mode of action has not been determined.

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³ Other resistance mechanisms that are not linked to site of action (i.e., enhanced metabolism) are common for this group of chemicals.

⁴ Although compounds in Groups 4A and 4C are thought to have the same target site, current evidence suggests the risk of metabolic cross-resistance between Groups 4A and 4C is low. If there are no other alternatives, then compounds from Groups 4A and 4C may be rotated.

Table 8–3. Insecticide/Miticide Groups (cont'd)

Group	Type of Action	Chemical Sub-group or Exemplifying Active Ingredient	Product Name	Active Ingredient
21	energy metabolism	21A Mitochondrial complex I electron transport inhibitors (METI)	Nexter	pyridaben
23	lipid synthesis, growth regulation	Tetronic and tetramic acid derivatives	Envidor 240 SC	spirodiclofen
			Movento 240 SC	spirotetramat
			Oberon Flowable	spiromesefin
25	energy metabolism	Beta-ketonitrile derivatives	Nealta	cyflumetofen
28	nerve and muscle	Diamides	Altacor	chlorantraniliprole
			Exirel	cyantraniliprole
29	nerve	Chordotonal organ modulators - undefined target site	Beleaf 50 SG	flonicamid
NC	disrupt gut and other insect tissues	Granulosis virus	CYD-X	<i>Cydia pomonella</i> granulovirus
			Virosoft CP 4	<i>Cydia pomonella</i> granulovirus
UN	unknown	Bifenazate	Acramite 50 WS	bifenazate

NC = Not classified by IRAC, or group not indicated on product label. UN = Mode of action has not been determined.

¹ Indicates the active ingredient (a.i.) that puts it in this group.

² All members of Group 1 may not be cross-resistant, although they share the same primary target site and mode of action. For this reason, Group 1 is divided into sub-groups Group 1A and 1B, each with different mechanisms of resistance. Assume that cross-resistance exists between pesticides in each sub-group, but that rotation of pesticides between sub-groups is an acceptable part of a resistance management program.

³ Other resistance mechanisms that are not linked to site of action (i.e., enhanced metabolism) are common for this group of chemicals.

⁴ Although compounds in Groups 4A and 4C are thought to have the same target site, current evidence suggests the risk of metabolic cross-resistance between Groups 4A and 4C is low. If there are no other alternatives, then compounds from Groups 4A and 4C may be rotated.

9. Information on Pesticides

Efficacy Ratings for Pesticides

The value of all insecticides, miticides and fungicides is evaluated by the Pest Management Regulatory Agency (PMRA) prior to registration, which includes an assessment of efficacy. Wording on the product label such as control, suppression or partial suppression is used to describe the level of pest management provided by these products. The definitions of “control” and “suppression” for insecticides have a somewhat different meaning than the same terms applied to fungicides, according to the Pest Management Regulatory Agency’s *Value Guidelines for New Plant Protection Products and Label Amendments* and summarized in Table 9–1. *Pesticide Efficacy Ratings*, on this page.

Note: These guidelines are currently suggestions and are under review by the Pest Management Regulatory Agency. Current, approved Canadian labels may also include a statement “reduction in damage from” the target pest. This is an undefined level of control less than suppression, and this statement is still under review with the Pest Management Regulatory Agency.

For direct pests that cause damage to the fruit, it is important to choose products that provide control rather than suppression. However, if the pest is an indirect pest, and does not affect fruit directly, products labelled for suppression may be useful. Together with natural enemies or biological control, products used for suppression might be enough to prevent significant crop damage. Products labelled for suppression may also play a role in resistance management. By alternating with products from different families, the risk of pest resistance to important products can be reduced.

Price and intended markets play a big part of the decision to use products for suppression. Sometimes there are no other options for organic pest management. However, when using a new product for pest suppression, try to leave an untreated check and evaluate the benefits of using these products compared to the cost of application.

Table 9–1. Pesticide Efficacy Ratings

Pesticide	Efficacy Term	Defined As
Insecticide Miticide	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 reduce pest populations or damage to a level typically required to achieve commercially acceptable control. Under such situations, the level of performance offered by the product should still have value in a pest management program.
Fungicide	control	A consistent level of disease management, as defined by commercial standards and expectations in the market, when compared to untreated control plots. In general, disease control ratings would be between 80%–100%.
	suppression	A consistent level of disease management that is less than full control, as defined by commercial standards and expectations in the market, when compared to untreated control plots. In general, disease control ratings would be between 60%–100%. Suppression is defined as consistent disease reduction to a level that is not optimal but is still of commercial benefit.
	partial suppression	A level of disease management that is less than suppression, as defined by the commercial standards and expectations in the market. This label claim will generally only be considered for non-conventional fungicides. In general, disease control ratings would be less than 40%.

Source: Pest Management Regulatory Agency (PMRA), April 2016.

Handling and Mixing Pesticides

Water Volumes

When the pesticide label does not prescribe a carrier volume, the spray operator must decide the appropriate volume. Ideally, it will be enough to suspend the product in solution and distribute spray droplets evenly over the target surface(s) but not so much as to cause excess spray to run off the plants. The spray operator must consider a few factors when determining an appropriate volume:

- The mode-of-action of the product being applied. For example, a contact product will require a higher droplet density than a locally systemic product, which has limited translocation in plant tissues.
- The location of the target. For example, if the target is a mobile insect found predominately on the upper-side of the leaf surface, it will be easier to spray and less carrier will be required. However, if the target is a disease or insect that occurs deep in the plant canopy, more carrier volume will be required to penetrate and contact the pest.
- The row spacing, size, density and stage of development of the crop. The more plant canopy to be protected per hectare, the more carrier volume will be required to adequately cover all surfaces.

To confirm sufficient coverage, the sprayer operator requires some form of feedback. Visually inspecting foliar “wetness” and spray residue, or waiting to see if the spray successfully controlled the pest is not sufficient. By placing water-and-oil sensitive papers in key locations within the target canopy, the spray applicator can quantify coverage. Good coverage on the upper, and often lower, leaf surface is an essential component of the performance of many fungicides and insecticides. For more information on quantifying coverage, see sprayers101.com and *Airblast 101, A Handbook of Best Practices in Airblast Spraying*.

Formulations

Dry pesticide formulations include:

- **Wettable powders** – active ingredients added to a wetting and dispersion agent, such as talc mixed with water. They will not dissolve, but form a suspension that requires constant agitation. Unless the label states otherwise, premix wettable powders with water and add the slurry to the spray tank.

- **Granules** – a mix of dry, large free-flowing particles, usually with a low concentration of active ingredient. They are ready to be added directly to water.
- **Soluble powders** – dry materials, similar to granules, but dissolve in water.

Liquid pesticide formulations mix in water to form a solution. Some pesticides may be oil-based, such as emulsifiable concentrates, and form an opaque (milky) emulsion that requires agitation.

Soluble Packaging

Water-soluble packaging is used for dry flowable and wettable powder formulations. In most cases, the water-soluble packaging material is PVA (polyvinyl alcohol), which dissolves completely when added to the tank water according to instructions. Read labels carefully.

- Keep soluble pouches dry until added to the spray tank.
- Do not handle pouches with wet hands or wet gloves.
- Do not remove pouches from the outer package until just before use.
- Always reseal the outer package to protect the remaining pouches from moisture.

Mixing Soluble Pouches

Consult product labels for specific mixing instructions for each product.

1. Half-fill the spray tank with water and have the agitator running. Add pouches directly to the tank (not into the basket).
2. Most pouches dissolve completely within 5 minutes, depending on water temperature and agitation.
3. As the tank continues to fill, add any other compatible pesticides.

Do not add:

- A pesticide that is incompatible with the PVA packaging material, such as oils (e.g., Superior Oil) and emulsifiable concentrate formulations containing mineral or vegetable oil.

- Any material containing boron, chelated micronutrients or water-soluble fertilizers. Rinse spray tank carefully after applying these nutrients.

Compatibility of Spray Materials

Users of commercial-class pest control products for crop protection or vegetation management are permitted to apply unlabelled tank mixes as long as:

- each product is registered for use in Canada on the crop.
- each product is used according to the label.
- the tank-mix only includes an adjuvant when specifically required by one of the product labels.
- the application timing of each product is compatible with crop and pest staging.
- no product is specifically excluded on any other of the tank-mix product labels.

For information on compatibility of spray materials, always check the product label. Physical incompatibility can result in a physical change in the solution. Components of the combined product may plug nozzles or become solidified or gummy in the tank. Chemical incompatibility can result in a chemical change in the solution. This can lead to reduced efficacy, or can cause plant injury when sprayed on the crop.

Generally, compatibility:

- varies with the formulation of the products. For example, two products may be compatible as wettable powder formulations, but the same active ingredient may be incompatible as emulsifiable concentrate formulations.
- refers to two-way mixtures. Adding a third product to a tank-mix, even if all are compatible with each other in two-way combinations, may result in incompatibility.
- may depend on the solvents and emulsifiers the manufacturer uses. Emulsifiable concentrates are more likely to cause compatibility problems than wettable powders.

Specifically:

- Add Captan or Maestro first when mixing with emulsifiable concentrate formulations of pyrethroids. Apply immediately with constant agitation.
- Do not mix pesticides with lime sulphur or streptomycin.
- Do not use oil sprays within 14 days of Captan or Maestro, including the oil used with Agri-Mek.

For more information on compatibility, contact the product manufacturer or distributor.

Jar Test for Pesticide Compatibility

Always check the product labels for information on compatibility of spray materials. “Compatibility” refers to the physical and/or chemical compatibility of two or more products in a solution. If you are concerned, you should perform a jar test.

Always wear personal protective equipment (PPE) when performing a jar test. Do so in a safe and ventilated area, away from sources of ignition.

1. Measure 500 ml of water into a 1 litre glass jar. This should be the same water you would use to fill a spray tank.
2. Add ingredients according to Table 9–2. *Tank-Mix Order for Pesticide Compatibility Test*, page 410, stirring after each addition.
3. Let the solution stand in a ventilated area for 15 minutes and observe the results. If the mixture is giving off heat, these ingredients are not compatible. If gel or scum forms or solids settle to the bottom (except for the wettable powders) then the mixture is likely not compatible.
4. If no signs of physical incompatibility appear, test the mixture using a spray bottle on a small area where it is to be applied. Look for phytotoxic indications, such as plant damage, and monitor efficacy (this will be hard to do unless you fill the sprayer and try it on a few plants).

Table 9–2. Tank-mix Order for Pesticide Compatibility Test

Order	Ingredient	Quantity for 500 ml or 500 g of Product Labeled for 1,000 L of Final Spray Volume
1	compatibility agents	5 ml (1 teaspoon)
2	water-soluble packets, wettable powders and dry flowables	15 g (1 tablespoon)
3	liquid drift retardants	5 ml (1 teaspoon)
4	liquid concentrates, micro-emulsions and suspension concentrates	5 ml (1 teaspoon)
5	emulsifiable concentrates	5 ml (1 teaspoon)
6	water-soluble concentrates or solutions	5 ml (1 teaspoon)
7	remaining adjuvants and surfactants	5 ml (1 teaspoon)

Factors Impacting Pesticide Performance

Water quality can affect pesticide performance. The four variables are: pH (acidity & alkalinity), dissolved minerals (water hardness or softness), suspended particles (dirty water) and temperature. For more information, see sprayers101.com, OMAFRA Factsheet 09–037, *How Weather Conditions Affect Spray Applications* and OMAFRA Factsheet 09–039, *Six Elements of Effective Spraying in Orchards and Vineyards*.

Filling the Tank

Pesticide labels usually provide directions for mixing different materials, including the sequence for mixing. The order in which you add each product to the tank, or inductor, is critical. For the latest information, see sprayers101.com.

Spray drift

Do you know what pesticide drift looks like or what you can do about it? OMAFRA and CropLife Canada have created two short videos with innovative visual demonstrations using dyes and night-spraying to show what drift actually looks like. See how spray particles behave and discover what changes can be made to your spray program to greatly reduce the risk of pesticide drift. Learn more at ontario.ca/spraydrift.

For more information on pesticide handling and operator safety, consult the Ontario Pesticide Education Program (OPEP) Grower Pesticide Safety course (www.opep.ca/resources).

Pesticides Used on Fruit Crops in Ontario

In this section:

Table 9–3. *Pesticides Used on Fruit Crops in Ontario by Active Ingredient*, on this page.

Table 9–4. *Pesticides Used on Fruit Crops in Ontario*, page 415.

Table 9–5. *Thinners and Plant Growth Regulators Used on Fruit Crops in Ontario*, page 425.

Only crops included in this publication are listed under pesticide registrations in Table 9–4. 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 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. See Health Canada's *Residue Chemistry Crop Groups* (<https://www.canada.ca/en/health-canada/services/consumer-product-safety/pesticides-pest-management/public/protecting-your-health-environment/pesticides-food/residue-chemistry-crop-groups.html>) for a complete list of all crops included in both original and revised crop groups. Growers of low acreage, specialty fruit should always check product labels to ensure the product is registered on their crop.

Table 9–3. Pesticides Used on Fruit Crops in Ontario by Active Ingredient

Common Name/Active Ingredient	TRADE or BRAND Name *
abamectin	AGRI-MEK SC
acephate	ORTHENE 75% SP
acequinocyl	KANEMITE 15 SC
acetamiprid	ASSAIL 70 WP
ametoctradin + dimethomorph	ZAMPRO
<i>Aureobasidium pullulans</i>	BLOSSOM PROTECT, BOTECTOR
aviglycine hydrochloride	RETAIN
azoxystrobin	QUADRIIS FLOWABLE
azoxystrobin + propiconazole	QUILT

Common Name/Active Ingredient	TRADE or BRAND Name *
<i>Bacillus amyloliquefaciens</i>	DOUBLE NICKEL LC
<i>Bacillus subtilis</i>	SERENADE OPTI
<i>Bacillus thuringiensis</i> var. <i>kurstaki</i>	BIOPROTEC CAF, DIPEL 2X DF, FORAY 48 BA
6-benzyladenine	MAXCEL
6-benzyladenine + gibberellins	PROMALIN SL
6-benzylaminopurine	CILIS PLUS
6-benzylaminopurine + gibberellins	PERLAN
benzovindiflupyr + difenoconazole	APROVIA TOP 195 EC
BLAD polypeptide	FRACTURE

* Mention of a TRADE or BRAND name does not constitute a guarantee or warranty of the product by the Ontario Crop Protection Committee or the Ontario Ministry of Agriculture, Food & Rural Affairs.

Table 9–3. Pesticides Used on Fruit Crops in Ontario by Active Ingredient (cont'd)

Common Name/Active Ingredient	TRADE or BRAND Name *	Common Name/Active Ingredient	TRADE or BRAND Name *
bifenthrin	CAPTURE 240 EC	deltamethrin	DECIS 5 EC
bifenazate	ACRAMITE 50 WS	deltamethrin + imidacloprid	CONCEPT
calcium polysulphide	LIME SULPHUR	diazinon	DIAZINON 500 E
boscalid	CANTUS WDG	difenoconazole + benzovindiflupyr	APROVIA TOP 195 EC
boscalid + pyraclostrobin	PRISTINE WG	difenoconazole + cyprodinil	INSPIRE SUPER
canola oil	VEGOL CROP OIL	dimethoate	CYGON 480-AG, LAGON 480 E
captan	MAESTRO 80 DF, SUPRA CAPTAN 80 WDG	dimethomorph	FORUM
carbaryl	SEVIN XLR	dimethomorph + ametoctradin	ZAMPRO
chlorantraniliprole	ALTACOR	dodine	EQUAL 65 WP, SYLLIT 400 FL
chloropicrin	CHLOROPICRIN 100, PIC PLUS FUMIGANT	ethephon	ETHREL
chlorothalonil	BRAVO ZN, ECHO 90 DF	famoxadone + cymoxanil	TANOS 50 DF
chlorpyrifos	LORSBAN 50 W, PYRINEX 480 EC, WARHAWK 480 EC	fenbuconazole	INDAR
citric acid + lactic acid	TIVANO	fenhexamid	ELEVATE 50 WDG
clofentezine	APOLLO SC	ferbam	FERBAM 76 WDG
clothianidin	CLUTCH 50 WDG	ferric phosphate	SLUGGO PROFESSIONAL
copper hydroxide	KOCIDE 2000	flonicamid	BELEAF 50 SG
copper octanoate	CUEVA	fluazinam	ALLEGRO 500 F
copper oxychloride	COPPER SPRAY, GUARDSMAN COPPER OXYCHLORIDE 50	fludioxonil	SCHOLAR 230 SC
copper sulphate, tri-basic	COPPER 53 W	fludioxonil + cyprodinil	SWITCH 62.5 WG
cyantraniliprole	EXIREL	fluopyram	VELUM PRIME
cyazofamid	TORRENT 400 SC	flupyradifurone	SIVANTO PRIME
<i>Cydia pomonella</i> granulovirus	CYD-X, VIROSOFT CP4	flutriafol	FULLBACK 125 SC
cyflumetofen	NEALTA	fluopyram + pyrimethanil	LUNA TRANQUILITY
cymoxanil + famoxadone	TANOS 50 DF	fluxapyroxad	SERCADIS
cypermethrin	MAKO, UP-CYDE 2.5 EC	folpet	FOLPAN 80 WDG
cyprodinil + difenoconazole	INSPIRE SUPER	fosetyl al	ALIETTE
cyprodinil + fludioxonil	SWITCH 62.5 WG	garlic powder	BURAN
		gibberellic acid	FALGRO TABLET

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Table 9–3. Pesticides Used on Fruit Crops in Ontario by Active Ingredient (cont'd)

Common Name/Active Ingredient	TRADE or BRAND Name *	Common Name/Active Ingredient	TRADE or BRAND Name *
gibberellins + 6-benzyladenine	PROMALIN SL	mineral oil	PURESpray GREEN SPRAY OIL 13 E, SUPERIOR 70 OIL, SUPERIOR 70 OIL E
gibberellins + 6-benzylaminopurine	PERLAN	myclobutanil	NOVA
imidacloprid	ADMIRE 240 FLOWABLE, ALIAS 240 SC	1-naphthaleneacetic acid	FRUIT FIX CONCENTRATE, FRUITONE-L
imidacloprid + deltamethrin	CONCEPT	novaluron	RIMON 10 EC
iprodione	ROVRAL WP	oriental mustard seed meal	MUSTGROW
isofetamid	KENJA 400 SC	oxamyl	VYDATE L
kaolin	SURROUND WP	penthiopyrad	FONTELIS
kasugamycin	KASUMIN 2L	permethrin	AMBUSH 500 EC, PERM-UP EC, POUNCE 384 EC
kresoxim-methyl	SOVRAN	pheromone	ISOMATE-CM/OFM TT, ISOMATE-DWB, ISOMATE-GBM PLUS, ISOMATE-PTB DUAL, ISOMATE OFM TT
lactic acid + citric acid	TIVANO	phosmet	IMIDAN WP
lambda-cyhalothrin	MATADOR 120 EC, SILENCER 120 EC	phosphites, ammonium, potassium, mono- and di-basic sodium	PHOSTROL
malathion	MALATHION 85 E	phosphorous acid, mono- and di-potassium salts of phosphorous acid	CONFINE EXTRA, RAMPART
mancozeb	DITHANE RAINSHIELD, MANZATE PRO-STICK, PENNCOZEB 75 DF RAINCOAT	potassium bicarbonate	MILSTOP, SIROCCO
mancozeb + metalaxyl	RIDOMIL GOLD MZ 68 WG	potassium salts of fatty acids	KOPA, OPAL
mancozeb + zoxamide	GAVEL 75 DF	prohexadione calcium	APOGEE
mandestrobin	INTUITY	prohydrojasmon	BLUSH
mandipropamid	REVUS	propiconazole	BUMPER 432 EC, FITNESS, JADE, TILT 250 E
metalaxyl-m and s-isomer	RIDOMIL GOLD 480 SL	propiconazole + azoxystrobin	QUILT
metalaxyl-m and s-isomer + mancozeb	RIDOMIL GOLD MZ 68 WG	prothioconazole	PROLINE 480 SC
metam potassium	BUSAN 1180	<i>Pseudomonas syringae</i>	BIO-SAVE 10 LP
metam sodium	BUSAN 1020, BUSAN 1236, ENFUSE M510, VAPAM HL	pyraclostrobin	CABRIO EG
metconazole	QUASH	pyraclostrobin + boscalid	PRISTINE WG
methomyl	LANNATE TOSS-N-GO	pyrethrins	PYGANIC EC 1.4 II
methoxyfenozide	INTREPID	pyridaben	NEXTER
1-methylcyclopropene	HARVISTA 1.3 SC	pyrimethanil	SCALA SC
metiram	POLYRAM DF	pyrimethanil + fluopyram	LUNA TRANQUILITY
metrafenone	VIVANDO SC		

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Table 9–3. Pesticides Used on Fruit Crops in Ontario by Active Ingredient (cont'd)

Common Name/Active Ingredient	TRADE or BRAND Name *
pyriofenone	PROPERTY 300 SC
quinoxifen	QUINTEC
<i>Reynoutria sachalinensis</i> extract	REGALIA MAXX
spinetoram	DELEGATE
spinetoram + sulfoxaflor	TWINGUARD
spinosad	ENTRUST, GF-120 FRUIT FLY BAIT, SUCCESS
spirodiclofen	ENVIDOR 240 SC
spiromesifen	OBERON FLOWABLE
spirotetramat	MOVENTO 240 SC
spiroxamine	PRIWEN
<i>Streptomyces lydicus</i>	ACTINOVATE SP
streptomycin sulfate	STREPTOMYCIN 17
sulfoxaflor	CLOSER
sulfoxaflor + spinetoram	TWINGUARD

Common Name/Active Ingredient	TRADE or BRAND Name *
sulphur	COSAVET EDGE DF, KUMULUS DF, MICROSCOPIC SULPHUR WP, MICROSCOPIC WETTABLE SULPHUR, MICROTHIOL DISPERSS
tea tree oil	TIMOREX GOLD
tebufenozide	CONFIRM 240 F
tetraconazole	METTLE 125 ME
thiabendazole	MERTECT SC
thiacloprid	CALYPSO 480 SC
thiamethoxam	ACTARA 25 WG
thiophanate methyl	SENATOR 50 SC
thiram	GRANUFLO T
trifloxystrobin	FLINT
triforine	FUNGINEX DC
zoxamide + mancozeb	GAVEL 75 DF

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Table 9–4. Pesticides Used on Fruit Crops in Ontario

Registration Number	TRADE or BRAND Name *	Common Name/ Active Ingredient	Use ¹	Crop Registrations	Formulation ²	Guaranteed Active	Ont. Class
27925	ACRAMITE 50 WS	bifenazate	a	apple, apricot, blackberry, cherry, grape, hazelnut, peach, pecan, plum, raspberry, sweet chestnut, walnut	WSP	50%	4
28408	ACTARA 25 WG	thiamethoxam	i	apple, blackberry, blueberry, cherry, currant, gooseberry, pear, raspberry, saskatoon berry, strawberry	D	25%	3
28672	ACTINOVATE SP	<i>Streptomyces lydicus</i> strain WYEC108	f	blueberry, grape, strawberry	D	0.037%	4
24094	ADMIRE 240 FLOWABLE	imidacloprid	i	apple, apricot, blackberry, blueberry, cherry, currant, gooseberry, grape, hazelnut, peach, pear, pecan, plum, raspberry, saskatoon berry, strawberry, sweet chestnut, walnut	L	240 g/L	4
31607	AGRI-MEK SC	abamectin	a, i	apple, blackberry, grape, pear, raspberry, strawberry	L	84 g/L	3
28475	ALIAS 240 SC	imidacloprid	i	apple, blackberry, blueberry, cherry, peach, raspberry, saskatoon berry, strawberry	L	240 g/L	4
27688	ALIETTE	fosetyl al	f	apple, blackberry, blueberry, grape, raspberry, strawberry	D	80%	3
27517	ALLEGRO 500 F	fluazinam	f	apple, blueberry, currant, gooseberry	L	40%	3
28981	ALTACOR	chlorantraniliprole	i	apple, apricot, blackberry, blueberry, cherry, currant, gooseberry, grape, hazelnut, peach, pear, pecan, plum, raspberry, saskatoon berry, strawberry, sweet chestnut, walnut	D	35%	2
14882	AMBUSH 500 EC	permethrin	i	apple, grape, peach, pear, plum	EC	500 g/L	4
28042	APOGEE	prohexadione calcium	pgr	apple, cherry, strawberry	D	27.5%	4
21035	APOLLO SC	clofentezine	a	apple, peach, pear, raspberry, strawberry	L	500 g/L	3
31526	APROVIA TOP 195 EC	difenoconazole + benzovindiflupyr	f	apple, grape, pear	EC	117 g/L + 78 g/L	2
27128	ASSAIL 70 WP	acetamiprid	i	apple, apricot, blackberry, blueberry, cherry, currant, gooseberry, grape, nectarine, peach, pear, plum, raspberry, saskatoon berry, strawberry	D	70%	4

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Table 9–4. Pesticides Used on Fruit Crops in Ontario (cont'd)

Registration Number	TRADE or BRAND Name *	Common Name/ Active Ingredient	Use ¹	Crop Registrations	Formulation ²	Guaranteed Active	Ont. Class
29796	BELEAF 50 SG	flonicamid	i	apple, apricot, blueberry, cherry, peach, pear, plum, strawberry	D	50%	4
26854	BIOPROTEC CAF	<i>Bacillus thuringiensis</i> var. <i>kurstaki</i>	i	apple, apricot, blackberry, blueberry, cherry, currant, gooseberry, grape, hazelnut, peach, pear, pecan, plum, raspberry, saskatoon berry, strawberry, sweet chestnut, walnut	L	8.12%	3
29673	BIO-SAVE 10 LP	<i>Pseudomonas syringae</i> strain ESC-10	f	apple, cherry, pear	D	9 x 10 ¹⁰ CFU/g	4
30552	BLOSSOM PROTECT	<i>Aureobasidium pullulans</i> strains DSM 14940/14941	b	apple, pear	D	5 x 10 ⁹ CFU/g	3
31248	BOTECTOR	<i>Aureobasidium pullulans</i> strains DSM 14940/14941	f	blueberry, grape, strawberry	D	5 x 10 ⁹ CFU/g	3
28900	BRAVO ZN	chlorothalonil	f	blueberry, cherry, hazelnut, peach, strawberry	L	500 g/L	3
28017	BUMPER 432 EC	propiconazole	f	apricot, blackberry, blueberry, cherry, peach, plum, raspberry, saskatoon berry, strawberry	EC	432 g/L	3
30601	BURAN	garlic powder	f	apple, grape, pear	L	15%	3
19421	BUSAN 1020	metam sodium	f, h, n	fruit crops (before planting)	L	33%	4
25124	BUSAN 1180	metam potassium	f, h, n	fruit crops (before planting)	L	54%	3
25103	BUSAN 1236	metam sodium	f, h, n	fruit crops (before planting)	L	42%	4
27323	CABRIO EG	pyraclostrobin	f	apricot, blueberry, cherry, peach, plum, strawberry	D	20%	4
28429	CALYPSO 480 SC	thiacloprid	i	apple, pear	L	480 g/L	3
30141	CANTUS WDG	boscalid	f	apricot, blackberry, blueberry, cherry, currant, gooseberry, grape, peach, plum, raspberry, strawberry	D	70%	2
31396	CAPTURE 240 EC	bifenthrin	i	raspberry	L	240 g/L	3
25863	CHLOROPICRIN 100	chloropicrin	f, n	raspberry, strawberry (before planting)	L	99%	2
30826	CLOSER	sulfoxaflor	i	apple, apricot, cherry, grape, hazelnut, peach, pear, pecan, plum, sweet chestnut, walnut	L	240 g/L	3
29382	CLUTCH 50 WDG	clothianidin	i	apple, apricot, cherry, grape, peach, pear, plum, strawberry	D	50%	2

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Table 9–4. Pesticides Used on Fruit Crops in Ontario (cont'd)

Registration Number	TRADE or BRAND Name *	Common Name/ Active Ingredient	Use ¹	Crop Registrations	Formulation ²	Guaranteed Active	Ont. Class
29611	CONCEPT	imidacloprid + deltamethrin	i	blueberry	L	75 g/L + 10 g/L	3
30648	CONFINE EXTRA	mono- and di-potassium salts of phosphorous acid	f	blueberry, grape, strawberry	L	53%	4
24503	CONFIRM 240 F	tebufenozide	i	apple, blueberry, currant, gooseberry, pear, saskatoon berry	L	240 g/L	3
9934	COPPER 53 W	basic copper sulphate	b, f	apple, currant, gooseberry, grape, peach, pear, raspberry, strawberry, tart cherry	D	53.4%	3
19146	COPPER SPRAY	copper oxychloride	f	apple, blueberry, hazelnut, grape, peach, pear, raspberry, tart cherry, walnut	D	50%	4
31869	COSAVET DF EDGE	sulphur	a, f	apple, cherry, grape, peach, pear, plum, saskatoon berry	D	80%	3
31825	CUEVA	copper octanoate	f	apple, apricot, blackberry, blueberry, cherry, currant, gooseberry, grape, hazelnut, peach, pear, plum, strawberry, raspberry, walnut	L	1.8%	4
30120	CYD-X	<i>Cydia pomonella</i> granulovirus	i	apple	L	0.06%	3
25651	CYGON 480-AG	dimethoate	i	blueberry, cherry, hazelnut, peach (non-bearing), pear, strawberry	EC	480 g/L	3
22478	DECIS 5 EC	deltamethrin	i	apple, blueberry, peach, pear, nectarine, strawberry	EC	50 g/L	3
28778	DELEGATE	spinetoram	i	apple, apricot, blackberry, blueberry, cherry, currant, gooseberry, grape, hazelnut, peach, pear, pecan, plum, raspberry, saskatoon berry, strawberry, sweet chestnut, walnut	D	25%	3
11889	DIAZINON 500 E	diazinon	i	blackberry, raspberry	EC	500 g/L	3
26508	DIPEL 2X DF	<i>Bacillus thuringiensis</i> var. <i>kurstaki</i>	i	apple, apricot, blackberry, blueberry, cherry, currant, gooseberry, grape, hazelnut, peach, pear, pecan, plum, raspberry, saskatoon, strawberry, sweet chestnut, walnut	D	57%	4
20553	DITHANE RAINSHIELD	mancozeb	f	apple, grape	D	75%	4
31887	DOUBLE NICKEL LC	<i>Bacillus amyloliquefaciens</i> strain D-747	b, f	apple, grape, pear, strawberry	L	1 x 10 ¹⁰ spores/mL	3

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Table 9–4. Pesticides Used on Fruit Crops in Ontario (cont'd)

Registration Number	TRADE or BRAND Name *	Common Name/ Active Ingredient	Use ¹	Crop Registrations	Formulation ²	Guaranteed Active	Ont. Class
29356	ECHO 90 DF	chlorothalonil	f	blueberry, peach, strawberry, tart cherry	L	90%	4
25900	ELEVATE 50 WDG	fenhexamid	f	blackberry, blueberry, cherry, currant, gooseberry, grape, peach, raspberry, strawberry	D	50%	3
29142	ENFUSE M 510	metam sodium	f, h ,n	fruit crops (before planting)	L	42%	4
30382	ENTRUST	spinosad	i	apple, apricot, blackberry, blueberry, cherry, currant, gooseberry, grape, peach, pear, plum, raspberry, saskatoon berry, strawberry	L	240 g/L	4
28051	ENVIDOR 240 SC	spirodiclofen	a	apple, apricot, blueberry, cherry, grape, hazelnut, peach, pear, pecan, plum, sweet chestnut, walnut	L	240 g/L	4
15608	EQUAL 65 WP	dodine	f	apple, cherry, pear	D	65%	4
30895	EXIREL	cyantraniliprole	i	apple, apricot, blueberry, cherry, currant, gooseberry, hazelnut, peach, pear, pecan, plum, raspberry, saskatoon berry, strawberry, sweet chestnut, walnut	L	100 g/L	3
20136	FERBAM 76 WDG	ferbam	f	apple, apricot, blackberry, blueberry, cherry, currant, grape, peach, pear, plum, raspberry	D	76%	4
32639	FITNESS	propiconazole	f	apricot, blackberry, blueberry, cherry, nectarine, peach, plum, saskatoon berry, strawberry	EC	418 g/L	3
30619	FLINT	trifloxystrobin	f	apple, apricot, cherry, hazelnut, grape, peach, pear, plum, strawberry	D	50%	4
27733	FOLPAN 80 WDG	folpet	f	apple, grape, strawberry	D	80%	4
30331	FONTELIS	penthiopyrad	f	apple, apricot, blueberry, cherry, hazelnut, peach, pear, plum, strawberry, sweet chestnut, walnut	L	200 g/L	4
24978	FORAY 48 BA	<i>Bacillus thuringiensis</i> var. <i>kurstaki</i>	i	apple, blueberry, pear, raspberry	L	10 BIU/kg	4
32026	FORUM	dimethomorph	f	grape	L	500 g/L	3
32139	FRACTURE	BLAD polypeptide	f	apricot, cherry, grape, peach, plum, strawberry	L	20%	4
31679	FULLBACK 125 SC	flutriafol	f	apple, grape, strawberry	L	125.08 g/L	2
27686	FUNGINEX DC	triforine	f	apple (non-bearing), blueberry, cherry, peach, plum, saskatoon berry	EC	190 g/L	3

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Table 9–4. Pesticides Used on Fruit Crops in Ontario (cont'd)

Registration Number	TRADE or BRAND Name *	Common Name/ Active Ingredient	Use ¹	Crop Registrations	Formulation ²	Guaranteed Active	Ont. Class
26842	GAVEL 75 DF	zoxamide + mancozeb	f	grape	D	8.3% + 66.7%	4
28336	GF-120 FRUIT FLY BAIT	spinosad	i	apple, blueberry, cherry, walnut	L	0.02%	4
30548	GRANUFLO-T	thiram	f	apple, peach, plum, strawberry	D	75%	3
13245	GUARDSMAN COPPER OXYCHLORIDE 50	copper oxychloride	f	apricot, blueberry, cherry, grape, hazelnut, peach, pear, raspberry	D	50%	3
29064	IMIDAN WP	phosmet	i	apple, blueberry, grape, peach, pear, plum, tart cherry	WSP	70%	3
27294	INDAR	fenbuconazole	f	apricot, blueberry, cherry, peach, plum	WSP	75%	2
30827	INSPIRE SUPER	difenoconazole + cyprodinil	f	apple, blueberry, pear	L	86 g/L + 249 g/L	2
27786	INTREPID	methoxyfenozide	i	apple, apricot, blackberry, blueberry, cherry, currant, gooseberry, grape, hazelnut, peach, pear, pecan, plum, raspberry, saskatoon berry, strawberry, sweet chestnut, walnut	L	240 g/L	3
32288	INTUITY	mandestrobin	f	strawberry, grape	L	43.4%	3
29352	ISOMATE-CM/OFM TT	pheromone, oriental fruit moth and codling moth	md	apple, apricot, cherry, peach, pear, plum, walnut	DIS	91.7%	4
30589	ISOMATE-DWB	pheromone, dogwood borer	md	apple, apricot, blueberry, cherry, hazelnut, peach, pear, pecan, plum, sweet chestnut, walnut	DIS	87.1%	4
27525	ISOMATE-GBM PLUS	pheromone, grape berry moth	md	grape	DIS	91.1%	4
31419	ISOMATE OFM TT	pheromone, oriental fruit moth	md	apple, apricot, cherry, peach, pear, plum	DIS	95.2%	4
30042	ISOMATE-PTB DUAL	pheromone, peachtree borer and lesser peachtree borer	md	apricot, cherry, peach, plum	DIS	87.9%	4
24030	JADE	propiconazole	f	apricot, blackberry, blueberry, cherry, peach, plum, raspberry, saskatoon berry, strawberry	EC	250 g/L	3
28641	KANEMITE 15 SC	acequinocyl	a	apple, blackberry, hazelnut, pear, pecan, raspberry, sweet chestnut, walnut	L	15.8%	3
30591	KASUMIN 2L	kasugamycin	b	apple, blackberry, cherry, pear, raspberry, saskatoon berry, walnut	L	2.0%	3

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Table 9–4. Pesticides Used on Fruit Crops in Ontario (cont'd)

Registration Number	TRADE or BRAND Name *	Common Name/ Active Ingredient	Use ¹	Crop Registrations	Formulation ²	Guaranteed Active	Ont. Class
31758	KENJA 400 SC	isofetamid	f	apple, apricot, blackberry, blueberry, cherry, currant, gooseberry, grape, peach, plum, raspberry, strawberry	L	400 g/L	3
27348	KOCIDE 2000	copper hydroxide	b, f	grape	D	53.8%	3
31433	KOPA	potassium salts of fatty acids	i	grape, hazelnut, pecan, sweet chestnut, walnut	L	47%	4
18836	KUMULUS DF	sulphur	a, f	apple, cherry, grape, peach, pear, plum, saskatoon berry	D	80%	4
9382	LAGON 480 E	dimethoate	i	blueberry, cherry, hazelnut, peach, pear, strawberry	EC	480 g/L	3
10868	LANNATE TOSS-N-GO	methomyl	i	apple	WSP	90%	2
16465	LIME SULPHUR	calcium polysulphide	a, f, i	apple, blackberry, blueberry, cherry, gooseberry, grape, peach, pear, plum, raspberry, strawberry	L	30%	4
20944	LORSBAN 50 W	chlorpyrifos	i	peach, strawberry	WSP	50%	3
30510	LUNA TRANQUILITY	fluopyram + pyrimethanil	f	apple, blueberry, currant, gooseberry, grape (wine), pear, strawberry	L	125 g/L + 375 g/L	2
26408	MAESTRO 80 DF	captan	f	apple, apricot, blackberry, blueberry, cherry, grape, peach, pear, plum, raspberry, strawberry	D	80%	3
30316	MAKO	cypermethrin	i	apple, grape, peach, pear, strawberry	EC	407 g/L	4
8372	MALATHION 85 E	malathion	i	apple, apricot, blackberry, blueberry, cherry, grape, peach, pear, plum, raspberry, strawberry	EC	85%	3
28217	MANZATE PRO-STICK	mancozeb	f	apple, grape	D	75%	3
24984	MATADOR 120 EC	lambda-cyhalothrin	i	apple, cherry, peach, pear, plum, strawberry	EC	120 g/L	2
13975	MERTECT SC	thiabendazole	f	apple, pear	L	500 g/L	4
30673	METTLE 125 ME	tetraconazole	f	gooseberry, grape, strawberry	L	125 g/L	2
14653	MICROSCOPIC SULPHUR	sulphur	f	apple, cherry, currant, gooseberry, grape, peach, pear, plum, sea buckthorn	D	92%	4
873	MICROSCOPIC WETTABLE SULPHUR	sulphur	f	apple, cherry, grape, peach, pear, plum	D	92%	4
29487	MICROTHIOL DISPERSS	sulphur	a, f	apple, cherry, grape, peach, pear, plum, saskatoon berry	D	80%	4
28095	MILSTOP	potassium bicarbonate	f	apricot, grape, nectarine, peach, plum	D	85%	4

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Table 9–4. Pesticides Used on Fruit Crops in Ontario (cont'd)

Registration Number	TRADE or BRAND Name *	Common Name/ Active Ingredient	Use ¹	Crop Registrations	Formulation ²	Guaranteed Active	Ont. Class
28953	MOVENTO 240 SC	spirotetramat	i	apple, apricot, blueberry, blackberry, cherry, currant, gooseberry, grape, hazelnut, peach, pear, pecan, plum, raspberry, saskatoon berry, sweet chestnut, walnut	L	240 g/L	4
30263	MUSTGROW	oriental mustard seed meal	f, n	apple, apricot, blackberry, cherry, hazelnut, peach, pear, pecan, plum, raspberry, strawberry, sweet chestnut, walnut	P	100%	3
31284	NEALTA	cyflumetofen	a	apple, grape, pear, strawberry	L	200 g/L	3
25135	NEXTER	pyridaben	a, i	apple, cherry, grape, peach, pear, raspberry, strawberry	WSP	75%	3
22399	NOVA	myclobutanil	f	apple, blackberry, blueberry, cherry, currant, gooseberry, grape, peach, pear, raspberry, saskatoon berry, strawberry	WSP	40%	3
28905	OBERON FLOWABLE	spiromesifen	a, i	strawberry	L	240 g/L	3
28146	OPAL	potassium salts of fatty acids	a, i	apple, apricot, blueberry, cherry, grape, hazelnut, peach, pear, pecan, plum, raspberry, strawberry, sweet chestnut, walnut	L	47%	4
14225	ORTHENE 75% SP	acephate	i	saskatoon berry	D	75%	3
30241	PENNCOZEB 75 DF RAINCOAT	mancozeb	f	apple, grape	D	75%	3
28877	PERM-UP EC	permethrin	i	apple, grape, peach, pear, plum	EC	384 g/L	3
30449	PHOSTROL	mono- and di-basic sodium, potassium and ammonium phosphites	f	apple, blueberry, currant, gooseberry, grape, pear, raspberry, strawberry	L	53.6%	4
28715	PIC PLUS FUMIGANT	chloropicrin	f, n	strawberry, raspberry	L	85.1%	2
20087	POLYRAM DF	metiram	f	apple, grape	D	80%	4
16688	POUNCE 384 EC	permethrin	i	apple, grape, peach, pear, plum	EC	384 g/L	4
27985	PRISTINE WG	boscalid + pyraclostrobin	f	apple, apricot, blackberry, blueberry, cherry, currant, gooseberry, grape, peach, pear, plum, raspberry, saskatoon berry, strawberry	D	25.2% + 12.8%	2
31959	PRIWEN	spiroxamine	f	grape	EC	500 g/L	3

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Table 9–4. Pesticides Used on Fruit Crops in Ontario (cont'd)

Registration Number	TRADE or BRAND Name *	Common Name/ Active Ingredient	Use ¹	Crop Registrations	Formulation ²	Guaranteed Active	Ont. Class
28359	PROLINE 480 SC	prothioconazole	f	blueberry, currant, gooseberry, saskatoon berry	L	480 g/L	3
32534	PROPERTY 300 SC	pyriofenone	f	grape	L	300 g/L	3
27666	PURESpray GREEN SPRAY OIL 13 E	mineral oil	f, i	apple, apricot, blackberry, blueberry, cherry, currant, gooseberry, grape, hazelnut, peach, pear, plum, raspberry, saskatoon berry, strawberry, sweet chestnut	L	99%	4
30164	PYGANIC EC 1.4 II	pyrethrins	i	blueberry, grape, raspberry	EC	1.4%	4
23705	PYRINEX 480 EC	chlorpyrifos	i	hazelnut, strawberry	EC	480 g/L	3
26153	QUADRIS FLOWABLE	azoxystrobin	f	hazelnut, strawberry	L	250 g/L	3
30402	QUASH	metconazole	f	apricot, blueberry, cherry, currant, elderberry, hazelnut, nectarine, peach, plum, sea buckthorn	WSP	50%	3
28328	QUILT	azoxystrobin + propiconazole	f	blueberry	L	75 g/L + 125 g/L	3
29755	QUINTEC	quinoxifen	f	apricot, cherry, grape, peach, plum, strawberry	D	250 g/L	3
30654	RAMPART	mono- and di-potassium salts of phosphorous acid	f	blackberry, grape	L	53%	4
30199	REGALIA MAXX	<i>Reynoutria sachalinensis</i> extract	f	apple, apricot, blueberry, cherries, grape, peach, plum, strawberry	L	20%	3
29074	REVUS	mandipropamid	f	grape	L	250 g/L	3
28474	RIDOMIL GOLD 480 SL	metalaxyl-m and s-isomer	f	non-bearing apple, blueberry, raspberry, strawberry	L	480 g/L	3
28893	RIDOMIL GOLD MZ 68 WG	metalaxyl-m and s-isomer + mancozeb	f	grape	D	4% + 64%	3
28881	RIMON 10 EC	novaluron	i	apple, apricot, blueberry, cherry, currant, gooseberry, peach, plum, saskatoon berry, strawberry	EC	10%	2
15213	ROVRAL WP	iprodione	f	apricot, cherry, grape, nectarine, peach, plum, raspberry, strawberry	D	500 g/kg	3
28011	SCALA SC	pyrimethanil	f	apple, blueberry, gooseberry, grape, pear, raspberry, strawberry	L	400 g/L	3
29528	SCHOLAR 230 SC	fludioxonil	f	apple, apricot, cherry, peach, pear, plum, strawberry	L	230 g/L	2

* Mention of a TRADE or BRAND name does not constitute a guarantee or warranty of the product by the Ontario Crop Protection Committee or the Ontario Ministry of Agriculture, Food and Rural Affairs.

¹ a = Acaricide, miticide. b = Bactericide. ba = Bacterial antagonist. cp = Crop protectant. f = Fungicide. h = Herbicide. i = Insecticide. n = Nematicide. md = Mating disrupter. pgr = Plant growth regulator. s = Slug bait.

² D = Dry formulations (including wettable granule, wettable powder, water-dispersible granule). DIS = Dispenser units. EC = Emulsifiable concentrate. L = Liquid formulations (including liquid, suspension concentrate, solution, suspension, micro-emulsion). P = Particulate/pellet. WSP = Water-soluble packets.

Table 9–4. Pesticides Used on Fruit Crops in Ontario (cont'd)

Registration Number	TRADE or BRAND Name *	Common Name/ Active Ingredient	Use ¹	Crop Registrations	Formulation ²	Guaranteed Active	Ont. Class
32096	SENATOR 50 SC	thiophanate-methyl	f	apple, cherry, nectarine, peach, pear, plum, raspberry, strawberry	L	500 g/L	4
31697	SERCADIS	fluxapyroxad	f	apple, apricot, blackberry, blueberry, cherry, currant, gooseberry, grape, peach, pear, plum, raspberry, strawberry	L	300 g/L	2
31666	SERENADE OPTI	<i>Bacillus subtilis</i> strain QST 713	f	apple, apricot, blackberry, blueberry, cherry, currant, gooseberry, grape, peach, pear, plum, raspberry, saskatoon berry, strawberry	D	1.31 x 10 ¹⁰ CFU/g	3
27876	SEVIN XLR	carbaryl	i	blackberry, blueberry, raspberry	L	466 g/L	3
29052	SILENCER 120 EC	lambda-cyhalothrin	i	apple, cherry, peach, pear, plum, strawberry	EC	120 g/L	2
31091	SIROCCO	potassium bicarbonate	f	apricot, grape, peach, plum	D	85%	4
31452	SIVANTO PRIME	flupyradifurone	i	apple, apricot, blackberry, blueberry, cherry, currant, gooseberry, grape, hazelnut, peach, pear, pecan, plum, raspberry, saskatoon berry, strawberry, sweet chestnut, walnut	L	200 g/L	3
30025	SLUGGO PROFESSIONAL	ferric phosphate	s	fruit crops	P	0.28%	4
26257	SOVRAN	kresoxim-methyl	f	apple, pear, grape	D	50%	4
10305	STREPTOMYCIN 17	streptomycin sulphate	b, f	apple, pear	D	25.2%	4
26835	SUCCESS	spinosad	i	apple, apricot, blackberry, blueberry, cherry, currant, gooseberry, grape, pear, peach, plum, raspberry, saskatoon berry, strawberry	L	480 g/L	4
9542	SUPERIOR 70 OIL E	mineral oil	a, i	apple, apricot, blueberry, peach, pear, plum, saskatoon berry, tart cherry	EC	99%	4
14981	SUPERIOR 70 OIL	mineral oil	a, i	apple, apricot, blueberry, peach, pear, plum, tart cherry	EC	99%	4
24613	SUPRA CAPTAN 80 WDG	captan	f	apple, apricot, blackberry, blueberry, cherry, grape, peach, pear, plum, raspberry, strawberry	D	80%	3
27469	SURROUND WP	kaolin	cp, i	apple, apricot, cherry, grape, hazelnut, peach, pear, pecan, plum, raspberry, strawberry, sweet chestnut, walnut	D	95%	4
28189	SWITCH 62.5 WG	cyprodinil + fludioxonil	f	blackberry, blueberry, currant, gooseberry, grape, raspberry, saskatoon berry, strawberry	D	37.5% + 25%	3

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¹ a = Acaricide, miticide. b = Bactericide. ba = Bacterial antagonist. cp = Crop protectant. f = Fungicide. h = Herbicide. i = Insecticide. n = Nematicide. md = Mating disrupter. pgr = Plant growth regulator. s = Slug bait.

² D = Dry formulations (including wettable granule, wettable powder, water-dispersible granule). DIS = Dispenser units. EC = Emulsifiable concentrate. L = Liquid formulations (including liquid, suspension concentrate, solution, suspension, micro-emulsion). P = Particulate/pellet. WSP = Water-soluble packets.

Table 9–4. Pesticides Used on Fruit Crops in Ontario (cont'd)

Registration Number	TRADE or BRAND Name *	Common Name/ Active Ingredient	Use ¹	Crop Registrations	Formulation ²	Guaranteed Active	Ont. Class
28351	SYLLIT 400 FL	dodine	f	apple, cherry, nectarine, peach, pear	L	402 g/L	4
27435	TANOS 50 DF	famoxadone + cymoxanil	f	blackberry, raspberry	D	25% + 25%	3
19346	TILT 250 E	propiconazole	f	apricot, blackberry, blueberry, cherry, peach, plum, raspberry, saskatoon berry, strawberry	EC	250 g/L	3
30910	TIMOREX GOLD	tea tree oil	f	blueberry, grape, raspberry, strawberry	EC	23.8%	3
30468	TIVANO	citric acid + lactic acid	b, f	grape, strawberry	L	10.73 g/L + 21.37 g/L	4
30392	TORRENT 400 SC	cyazofamid	f	blackberry, grape, raspberry	L	34.5%	4
31442	TWINGUARD	sulfoxaflor + spinetoram	i	apple, apricot, cherry, peach, pear, plum	D	20% + 20%	3
28795	UP-CYDE 2.5 EC	cypermethrin	i	apple, grape, peach, pear, plum, strawberry	EC	250 g/L	3
29128	VAPAM HL	metam sodium	f, h, n	fruit crops (before planting)	L	42%	4
32408	VEGOL CROP OIL	canola oil	i, a, f	apple, apricot, blueberry, blackberry, cherry, currant, gooseberry, grape, hazelnut, nectarine, peach, pear, pecan, plum, raspberry, saskatoon berry, strawberry, sweet chestnut, walnut	EC	96%	4
32108	VELUM PRIME	fluopyram	n, f	strawberry	L	500 g/L	2
26533	VIROSOFT CP 4	<i>Cydia pomonella</i> granulovirus	i	apple	L	4 x 10 ¹³ OBs/L	4
29765	VIVANDO SC	metrafenone	f	cherry, grape, peach	L	300 g/L	2
17995	VYDATE L	oxamyl	i, n	apple (non-bearing), raspberry	L	240 g/L	2
29984	WARHAWK 480 EC	chlorpyrifos	i	hazelnut, strawberry	EC	480 g/L	3
30321	ZAMPRO	dimethomorph + ametoctradin	f	grape	L	225 g/L + 300 g/L	3

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² D = Dry formulations (including wettable granule, wettable powder, water-dispersible granule). DIS = Dispenser units. EC = Emulsifiable concentrate. L = Liquid formulations (including liquid, suspension concentrate, solution, suspension, micro-emulsion). P = Particulate/pellet. WSP = Water-soluble packets.

Table 9–5. Thinners and Plant Growth Regulators Used on Fruit Crops in Ontario

Registration Number	TRADE or BRAND Name *	Common Name/Active Ingredient	Use ¹	Formulation ²	Guaranteed Active	Ont. Class
28042	APOGEE	prohexadione calcium	PGR	D	27.5%	4
32167	BLUSH	prohydrojasmon	PGR	L	5.25%	4
29210	CILIS PLUS	6-benzylaminopurine	PGR, TH	L	2.0%	4
11580	ETHREL	ethephon	PGR	L	240 g/L	4
16027	FRUIT FIX CONCENTRATE	1-naphthaleneacetic acid	PGR	L	5.68%	4
27653	FALGRO TABLET	gibberellic acid	PGR	tablet	1.0 g/tablet	4
31460	FRUITONE L	1-naphthaleneacetic acid	PGR	L	3.1%	4
32752	HARVISTA 1.3 SC	1-methylcyclopropene	PGR	L	1.3%	4
28851	MAXCEL	6-benzyladenine	PGR, TH	L	1.9%	4
29187	PERLAN	6-benzylaminopurine (BA), gibberellins A ₄ + A ₇ (GA)	PGR	L	1.8% BA + 1.8% GA	4
16636	PROMALIN SL	benzyladenine (BA), gibberellins A ₄ + A ₇ (GA)	PGR	EC	1.8% BA + 1.8% GA	4
25609	RETAIN	aviglycine hydrochloride	PGR	D	15%	3
27876	SEVIN XLR	carbaryl	TH	L	466 g/L	3

* Mention of a BRAND or TRADE name does not constitute a guarantee or warranty of the product by the Ontario Crop Protection Committee or the Ontario Ministry of Agriculture, Food and Rural Affairs.

¹ PGR = Plant growth regulator. TH = Thinner.

² D = Dry formulation (including wettable granule, wettable powder). EC = Emulsifiable concentrate. L = Liquid formulation (including solution).

Pesticide Classification in Ontario

Under the *Pesticides Act* and Regulation 63/09, the Ontario Ministry of the Environment and Climate Change classifies federally registered pesticides into one of 12 classes. Each class has defined education, licensing and/or permit requirements and restrictions on its use and sale in Ontario. Pesticides are classified on the basis of their toxicity, environmental or health hazard, persistence, concentration, how they are used and their container size. The classification of each product in the publication can be found in Table 9–4. *Pesticides Used on Fruit Crops in Ontario*, page 415 and Table 9–5. *Thinners and Plant Growth Regulators Used on Fruit Crops in Ontario*, on this page.

Class 2 and 3 pesticides are the most hazardous. Regulation 63/09 of the *Pesticides Act* makes it mandatory for farmers to be certified to buy and use Class 2 or 3 pesticides on their farms. Pesticide storage requirements also vary by class. Detailed descriptions of each classification can be found at: ontario.ca/pesticides.

A farmer can become certified by attending a one-day Grower Pesticide Safety Course and passing the certification examination. To become a certified farmer, visit the Ontario Pesticide Education Program website at www.opecp.ca or call 1-800-652-8573.

APPENDIX A: Additional Resources for Ontario Fruit Growers

Many factsheets, publications and other resources are available from the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA). These can be ordered from Service Ontario:

- Online at ServiceOntario Publications:
ontario.ca/publications
- By phone through the ServiceOntario Contact Centre Monday–Friday, 8:30 a.m. - 5:00 p.m.
416-326-5300
416-325-3408 (TTY)
1-800-668-9938 Toll-free across Canada
1-800-268-7095 TTY Toll-free across Ontario
- In person at ServiceOntario Centres located throughout the province or at any OMAFRA Resource Centre. Many can also be found online at ontario.ca/omafra
- For a complete list of publications from OMAFRA: ontario.ca/omafra

OMAFRA Publications

- *Agronomy Guide for Field Crops* – Publication 811
- *Growing Strawberries in Ontario* – Publication 513
- *Growing Red Raspberries in Ontario* – Publication 105
- *Fruit Crop Protection Guide* – Publication 360
- *Guides to Weed Control* – Publication 75A Field Crops & Publication 75B Hort Crops
- *Integrated Pest Management for Ontario Apples* – Publication 310
- *Soil Fertility Handbook* – Publication 611
- *Vegetable Crop Protection Guide* – Publication 838

Websites

Websites for technical information on pests and production in Ontario fruit crops:

- OMAFRA gateway to information on crops: ontario.ca/crops
- Spotted wing drosophila: ontario.ca/spottedwing
- Brown marmorated stink bug: ontario.ca/stinkbug
- Crop IPM (integrated pest management) modules: ontario.ca/cropipm
- Label Search Tool to find labels for pesticides and products registered for use in Canada: <http://pr-rp.hc-sc.gc.ca/lr-re/index-eng.php>
- Information on pesticide application technology: www.sprayers101.com
- Specialty Croppportunities to find information on specialty berries and fruit: ontario.ca/crops (search on “croppportunities”)

Resources on Application Technology

- Ontario Pesticide Education Program: www.opecp.ca

OMAFRA Factsheets

- *Mating Disruption for Management of Insect Pests*
- *How Weather Conditions Affect Spray Applications*
- *Six Elements of Effective Spraying in Orchards and Vineyards*
- *Calibrating Airblast Sprayers*
- *Adjusting, Maintaining and Cleaning Airblast Sprayers*
- *Pesticide Drift from Ground Applications*

Airblast 101 Course Materials: basic tools for applying pesticides and plant growth modifiers in an effective, economic and environmentally responsible manner. For more information, contact the ministry Application Technology Specialist.

Best Management Practices

The Best Management Practices series of publications presents a practical, affordable approach to conserving a farm’s soil and water resources without sacrificing productivity.

A sampling of titles appears below. For a complete list of books in the BMP series, see: ontario.ca/agbestpractices.

- BMP01E Farm Forestry and Habitat Management
- BMP06E Soil Management
- BMP07E Water Management
- BMP08E Irrigation Management
- BMP09E Integrated Pest Management
- BMP13E Pesticide Storage, Handling and Application
- BMP15E Buffer Strips
- BMP16E Manure Management
- BMP20E Managing Crop Nutrients

APPENDIX B: Degree-Day Modeling

Temperature, light and humidity affect the growth and development of plants, disease-causing pathogens and insect pests. Of these, temperature is the most important factor for insect and mite development. These pests need a certain amount of heat to move to the next development stage. For pathogens, temperature and moisture play key roles in the development and infection of the plant.

The amount of heat required for insect, mite and pathogen development remains constant from year to year, but depending on weather conditions, the amount of actual time that it takes to complete development can vary. Insects, mites and pathogens have a minimum (lower) and maximum (upper) base temperature—below or above which development does not occur. These base temperatures are different for each organism.

Degree-Days Celsius (DDC) are used to estimate the growth and development of pests in the growing season (see Table 10–1. *Examples of Degree-Day Models Used in Fruit Crops*, page 429). Events such as peak egg-laying activity, egg hatch, movement of crawlers or the occurrence of disease infection can be predicted and used to schedule inspection and spray programs. For example, degree-day calculations can predict the first hatch of codling moth eggs or the percentage of apple scab ascospores that have matured in the orchard.

There are several methods used to calculate DDC, but the method commonly used with simple monitoring equipment is the averaging method or “max/min” method. DDC for a given organism are calculated as follows:

$$\text{DDC} = \frac{(\text{Daily max } ^\circ\text{C}) + (\text{Daily min } ^\circ\text{C})}{2} - \text{min base } ^\circ\text{C}$$

Degree-Days Celsius are accumulated daily. The averaging method works well in most years. However, the actual DDC accumulations may be underestimated in extended periods of cool weather or overestimated in hot weather.

An example of the averaging method on a relatively cool spring day:

For a given pest:

Lower base temperature = 10°C

Upper base temperature = 35°C

On a given day:

Minimum temperature = 5°C

Maximum temperature = 15°C

Degree-Days Celsius (DDC) for that day is =
(maximum + minimum temperature)/2 – lower base
temperature = (15 + 5) / 2 – 10 = 0 DDC

Note that the maximum temperature was higher than the base temperature for the insect, so growth and development were possible for at least part of the day. However, no DDC were accumulated. This illustrates how cool temperatures, especially over several days, could lead to an underestimation of insect development.

Degree-Days Celsius are either accumulated from a set start date, such as April 1, or from a specific event known as a biofix. A biofix is a biological event or indicator of a developmental event that initiates the beginning of DDC calculations. A common biofix used for insects is the first sustained catch in pheromone traps. Using a biofix provides predictions that are more accurate and requires tracking temperatures over a shorter period.

There are several limitations to degree-days models:

- Factors such as humidity, light intensity and rainfall also affect pest development. As a result, DDC predictions are only estimates of pest development. Verify these predictions with field observations.
- Temperatures used to determine DDC must represent the environment where organisms develop. Use weather data collected from within 2 km or less of the actual orchard or field being monitored. Site-specific information can be obtained by using data loggers. Ventilated heat shields should be used with temperature-sensor data loggers to ensure accurate air temperatures. Place data loggers at locations in the crop where the pest is normally active.
- DDC models have been developed and validated for only a few fruit pests in Ontario.
- DDC model calculators can be found on-line, such as <http://uspest.org/cgi-bin/ddmodel.us?spp=swd>.
- Keep in mind that many of these models have not been validated under Ontario conditions. Use precise temperature data measured on or very close to your farm for the best estimate of the development of these pests.

Table 10–1. Examples of Degree-Day Models Used in Fruit Crops

Pest	Base Temperature	Biofix	Predicted Event		Model (when to expect the event)
Apples					
Codling moth	10°C	sustained moth catch (1st generation)	1st generation	peak egg laying	83–111 DDC
				early egg hatch	111–138 DDC
				peak egg hatch	138 DDC
			2nd generation	peak egg laying	611–639 DDC
				early egg hatch	639–667 DDC
				peak egg hatch	667–694 DDC
Obliquebanded leafroller (summer generation)	6.1°C	sustained moth catch (summer generation)	1st egg hatch		220–244 DDC
			peak egg hatch		240–280 DDC
Oriental fruit moth	7.2°C	Sustained moth catch (1st generation)	1st generation	peak egg laying	111–139 DDC
				early egg hatch	139–153 DDC
				peak egg hatch	194–208 DDC
			2nd generation	early egg hatch	750–778 DDC
				peak egg hatch	805–833 DDC
			3rd generation	early egg hatch	1305–1333 DDC
				peak egg hatch	1361–1389 DDC
San Jose scale	10°C	march 1	1st generation	start of crawler emergence	278 DDC
			2nd generation	start of crawler emergence	806 DDC
		sustained adult catch (each generation)	1st generation	start of crawler emergence	172 DDC
			2nd generation	start of crawler emergence	222 DDC
Apple scab ¹	0°C	bud break on McIntosh	high risk of primary infection	rapid maturation of ascospores	125 DDC
			end of primary infection	95% of ascospores should be depleted if sufficient rainfall has occurred	418 DDC

¹ Gadoury, D.M. and MacHardy, W.E. 1982. A model to estimate the maturity of ascospore of *Venturia inaequalis*. *Phytopathology* 72:901–904.

² Coop, L. and Dreves, A.J. 2013. Predicting when spotted wing drosophila begins activity using a degree-day model. Oregon State University. Retrieved online at http://whatcom.wsu.edu/ipm/swd/documents/Article_DDModel.pdf.

³ Tobin, P.C., Nagarkatti, S. and Saunders, M.C. 2001. Modeling development in grape berry moth (Lepidoptera: Tortricidae). *Environmental Entomology* 30(4):692–699.

Table 10–1. Examples of Degree-Day Models Used in Fruit Crops (cont'd)

Pest	Base Temperature	Biofix	Predicted Event		Model (when to expect the event)
Berries					
Tarnished plant bug (strawberries)	12.1°C	April 1	1st nymphs in strawberries		30–40 DDC
Spotted wing drosophila ²	10°C	January 1	overwintering generation	peak egg laying by overwintering females, 1st adult emergence	283 DDC
			1st generation	peak adult emergence	419 DDC
			2nd generation	peak adult emergence	694 DDC
			3rd generation	peak adult emergence	968 DDC
			4th generation	peak adult emergence	1243 DDC
Grapes					
Grape berry moth ³	8.3°C	50% bloom on wild grapes	1st generation	1st egg hatch	450 DDC
			2nd generation	1st egg hatch	900 DDC
			3rd generation	1st egg hatch	1,350 DDC
Tender Fruit					
Obliquebanded leafroller (summer generation)	6.1°C	sustained moth catch (summer generation)	1st egg hatch		220–244 DDC
			peak egg hatch		240–280 DDC
Oriental fruit moth	7.2°C	sustained moth catch (1st generation)	1st generation	peak egg laying	111–139 DDC
				early egg hatch	139–153 DDC
				peak egg hatch	194–208 DDC
			2nd generation	early egg hatch	750–778 DDC
				peak egg hatch	805–833 DDC
			3rd generation	early egg hatch	1305–1333 DDC
peak egg hatch	1361–1389 DDC				

¹ Gadoury, D.M. and MacHardy, W.E. 1982. A model to estimate the maturity of ascospore of *Venturia inaequalis*. *Phytopathology* 72:901–904.² Coop, L. and Dreves, A.J. 2013. Predicting when spotted wing drosophila begins activity using a degree-day model. Oregon State University. Retrieved online at http://whatcom.wsu.edu/ipm/swd/documents/Article_DDMModel.pdf.³ Tobin, P.C., Nagarkatti, S. and Saunders, M.C. 2001. Modeling development in grape berry moth (Lepidoptera: Tortricidae). *Environmental Entomology* 30(4):692–699.

APPENDIX C: Suppliers of Pest Monitoring Equipment and Biological Control Agents

This list includes sources of weather monitoring equipment, pest monitoring supplies and biological control agents. For a more extensive list of beneficial insects and mite suppliers, see the OMAFRA website at ontario.ca/crops. This is a partial list and does not imply endorsement or recommendation by the Ontario Ministry of Agriculture, Food and Rural Affairs of the companies listed.

Company	Address	Telephone/Fax/Email	Products
Anatis Bioprotection www.anatisbioprotection.com	278 rang Saint-André Saint-Jacques-le-Mineur, QC JOJ 1Z0	Toll-free: 1-800-305-7714 Email: info@anatisbioprotection.com	• beneficial insects and mites
Biobest Canada Ltd. www.biobestgroup.com	2020 Foxrun Rd. R.R. #4 Leamington, ON N8H 3V7	Tel: 519-322-2178 Fax: 519-322-1271 Email: info@biobest.ca	• beneficial insects, mites, nematodes • pheromone lures and traps • bumblebee hives for pollination
Cooper Mill Ltd. www.coopermill.com	31 Hastings Rd. R.R. #3 Madoc, ON KOK 2K0	Tel: 613-473-4847 Fax: 613-473-5080 Email: ipm@coopermill.com	• pheromone lures and traps
Distributions Solida Inc. www.solida.ca	480 rang St-Antoine St. Ferreol-les-Neiges, QC GOA 3R0	Tel: 418-826-0900 Fax: 418-826-0901 Email: info@solida.ca	• pheromone lures and traps • tangle traps, insect trap coating • hand lens magnifiers • tally counters
Gempler's www.gemplers.com	P.O. Box 5175 Janesville, WI USA 53547	Toll-free: 1-800-382-8473 Fax: 1-800-551-1128 Email: customerservice@gempler.com	• weather monitoring equipment • pheromone lures and traps • tangle traps • hand lens magnifiers • tally counters
Great Lakes IPM, Inc. www.greatlakesipm.com	10220 Church Rd. NE Vestaburg, MI USA 48891	Tel: 989-268-5693 Toll-free: 1-800-235-0285 Fax: 989-268-5311 Email: glipm@greatlakesipm.com	• apple scab monitoring equipment • pheromone lures and traps • tangle traps • hand lens magnifiers • tally counters • insect sweep nets • field diagnostic equipment

Company	Address	Telephone/Fax/Email	Products
Koppert Canada Ltd. www.koppertonline.ca	50 Ironside Cres. #2 Scarborough, ON M1X 1G4	Tel: 1-800-567-4195 Fax: 416-291-0902 Email: info@koppert.ca	• beneficial insects, mites • insect traps • BioWorks products
Natural Insect Control www.naturalinsectcontrol.com	3737 Netherby Rd. Stevensville, ON L0S 1S0	Tel: 905-382-2904 Fax: 905-382-4418 Email: nic@niagara.com	• beneficial insects, mites and nematodes (Canadian strains) • pheromone lures and traps • mating disruption devices • bird houses
N.M. Bartlett Inc. www.bartlett.ca	4509 Bartlett Rd. Beamsville, ON L0R 1B1	Tel: 905-563-8261 Toll-free: 1-800-767-8658 Fax: 905-563-7882 Email: info@bartlett.ca	• pheromone lures and traps • mating disruption devices
PheroTech	7572 Progress Way Delta, BC V4G 1E9	Tel: 604-940-9944 Fax: 604-940-9433 Email: sales@pherotech.com	• pheromone lures and traps
Plant Products Inc. www.plantproducts.com	50 Hazelton St. Leamington, ON N8H 1B8	Tel: 519-326-9037 Toll-free: 1-800-387-2449 Fax: 519-326-9290 Email: info@plantproducts.com	• pheromone lures and traps • mating disruption devices • rodent and tangle traps • sticky tape and cards • beneficial insects
Warwick Orchards and Nursery www.warwickorchards.ca	7056 Egremont Rd. R.R. #8 Watford, ON N0M 2S0	Tel: 519-849-6730 Fax: 519-849-6731 Email: warwickorchards@brktel.on.ca	• DeWitt leaf wetness sensor

APPENDIX D: Safety Supply Companies

This is a list of safety supply companies in Ontario providing protective clothing and personal protective equipment. Ask safety supply companies for help to select protective clothing and personal protective equipment. This is a partial list and does not imply endorsement or recommendation by the Ontario Ministry of Agriculture, Food and Rural Affairs of the companies listed.

Company	Address	Telephone/Fax/Email
3M Canada Company www.3mcanada.ca	300 Tartan Dr. London, ON N5V 4M9	Toll-free: 1-800-364-3577 Toll-free fax: 1-800-603-7758
Acklands Grainger www.acklandsgrainger.com	90 W. Beaver Creek Rd. Richmond Hill, ON L4B 1E7	Tel: 905-731-5516 Toll-free: 1-866-248-8801 Fax: 905-731-6053 Email: contact@agi.ca
Dupont Personal Protection Equipment www.personalprotection.dupont.ca	P.O. Box 2200 Streetsville Mississauga, ON L5M 2H3	Tel: 905-821-3300 Toll-free: 1-800-931-3456 Fax: 905-816-3059
Dutch Industries "Protect-Air Cab Filter" www.dutchopeners.com www.hurontractor.com	Huron Tractor 39995 Harvest Rd. Exeter, ON N0M 1S3	Tel: 519-235-1115 Fax: 519-235-1939
Hamisco Industrial Sales Inc. www.hamisco.com	3392 Wonderland Rd. S. London, ON N6L 1A8	Tel: 519-652-9800 Toll-free: 1-800-668-9800 Fax: 519-652-9661
Levitt-Safety (Eastern) Ltd. www.levitt-safety.com	2872 Bristol Circle Oakville, ON L6H 5T5	Tel: 905-829-3299 Toll-free: 1-888-453-8488 Fax: 905-829-2919 Email: csr@levitt-safety.com
The Mitt & Robe Company Ltd. www.mittrobe.ca	751 Norfolk St. N. Simcoe, ON N3Y 3R6	Tel: 519-428-4050 Toll-free: 1-877-893-6565 Fax: 519-428-5142 Email: sales@mittrobe.ca

Company	Address	Telephone/Fax/Email
MSA Canada www.msasafety.com	100 Westmore Dr., Unit 23 Toronto, ON M9V 5C3	Tel: 416-620-4225 Toll-free: 1-800-672-2222 Fax: 416-679-2875 Email: info@msasafety.com
Plant Products Inc. www.plantproducts.com	50 Hazelton St. Leamington, ON N8H 1B8	Tel: 519-326-9037 Toll-free: 1-800-387-2449 Fax: 519-326-9290 Email: info@plantproducts.com
Safety Express www.safetyexpress.com	4190 Sladeview Cres., Unit 1 & 2 Mississauga, ON L5L 0A1	Tel: 905-608-0111 Toll-free: 1-800-465-3898 Fax: 905-608-0091 Email: info@safetyexpress.com
The St. George Company Ltd. www.thestgeorgeco.com	20 Consolidated Dr. P.O. Box 430 Paris, ON N3L 3T5	Tel: 519-442-2046 Toll-free: 1-800-461-4299 Fax: 519-442-7191 Email: sales@thestgeorgeco.com

APPENDIX E: Accredited Soil-Testing Laboratories in Ontario

The following labs are accredited to perform soil tests for pH, buffer pH, potassium, phosphorus, magnesium and nitrate-nitrogen on Ontario soils.

Laboratory Name	Address	Telephone/Fax/Email	Contact
A & L Canada Laboratories Inc. www.alcanada.com	2136 Jetstream Rd. London, ON N5V 3P5	Tel: 519-457-2575 Fax: 519-457-2664 Email: aginfo@alcanada.com	Greg Patterson Ian McLachlin
Activation Laboratories Ltd. www.actlabsag.com	141 Bittern St. Ancaster, ON L9G 4V5	Tel: 905-648-9611 Fax: 905-648-9613 Email: victoriapechorina@actlabs.com	Rob Deakin Victoria Pechorina
SGS Agri-Food Laboratories www.agtest.com	503 Imperial Rd., Unit #1 Guelph, ON N1H 6T9	Tel: 519-837-1600 Toll-free: 1-800-265-7175 Fax: 519-837-1242 Email: lab@agtest.com	Jack Legg Papken Bedirian
Brookside Laboratories, Inc. www.blinc.com	200 White Mountain Dr. New Bremen, OH USA 45869	Tel: 419-977-2766 Fax: 419-977-2767 Email: jbrackman@blinc.com	Jackie Brackman Mark Flock
Eurofins Environment Testing Canada Inc. www.eurofins.com	8-146 Colonnade Rd. Ottawa, ON K2E 7Y1	Tel: 613-727-5692 Fax: 613-727-5222	—
Honeyland Ag Service www.honeylandag.com	3918 West Corner Dr. Ailsa Craig, ON N0M 1A0	Tel: 226-377-8485 Email: croelands@honeylandag.com	Chris Roelands
University of Guelph Laboratory Services https://guelphlabservices.com/	University of Guelph P.O. Box 3650, 95 Stone Rd. W. Guelph, ON N1H 8J7	Tel: 519-767-6299 Fax: 519-767-6240 Email: aflinfo@uoguelph.ca	Nick Schrier
Stratford Agri Analysis www.stratfordagri.ca	1131 Erie St. Box 760 Stratford, ON N5A 6W1	Tel: 519-273-4411 Toll-free: 1-800-323-9089 Fax: 519-273-2163 Email: info@stratfordagri.ca	Keith Lemp Mark Aikman

There is no official accreditation in Ontario for tissue analysis but all the accredited soil-testing labs are monitored for proficiency on tissue analyses.

APPENDIX F: Diagnostic Services

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

Pest Diagnostic Clinic
Laboratory Services Division
University of Guelph
95 Stone Rd. W.,
Guelph, ON N1H 8J7
Tel: 519-767-6299
Fax: 519-767-6240
Website: www.afl.uoguelph.ca
Email: aflinfo@uoguelph.ca

Payment must accompany samples at the time of submission. Submission forms are available at <http://afl.uoguelph.ca/submitting-samples#forms>.

To obtain information on the fee schedule, visit www.afl.uoguelph.ca or phone the Pest Diagnostic Clinic.

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 ½–1 L (1 pint–1 qt) from this. No single sample should represent more than 2.5 ha (6.25 acre). 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 ² (5,400 ft ²)	10 subsamples
500 m ² –0.5 ha (5,400 ft ² –1.25 acre)	25 subsamples
0.5 ha–2.5 ha (1.25–6.25 acre)	50 subsamples

Roots

From small plants, sample the entire root system plus adhering soil. For large plants, 10–20 g (½–1 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°–10°C (40°–50°F) 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 Ontario Ministry of Agriculture, Food and Rural Affairs office. Carefully fill in all of 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 three years and this year's pesticide use records.

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 drying out and contamination of the leaves by soil. 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 by 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 G: Ontario Ministry of Agriculture, Food and Rural Affairs – Fruit Crop Advisory Staff

Agroforestry Specialist	Todd Leuty	Tel: 519-826-3215	todd.leuty@ontario.ca
Application Technology Specialist	Jason Deveau	Tel: 519-426-8934	jason.deveau@ontario.ca
Crop Protection Specialist	Denise Beaton	Tel: 519-826-6594	denise.beaton@ontario.ca
Entomology, Horticulture	Hannah Fraser	Tel: 905-562-1674	hannah.fraser@ontario.ca
Fresh Market Quality Specialist	Jennifer R. DeEll	Tel: 519-426-1408	jennifer.deell@ontario.ca
Fruit Crop Specialist (berry)	Erica Pate	Tel: 519-426-2238	erica.pate@ontario.ca
Fruit Crop Specialist (tender fruit, grape)	Kathryn Carter	Tel: 905-562-1639	kathryn.carter@ontario.ca
Horticulture IPM Specialist (pome fruit)	Kristy Grigg-McGuffin	Tel: 519-426-4322	kristy.grigg-mcguffin@ontario.ca
Horticulture IPM Specialist (specialty crops)	Melanie Filotas	Tel: 519-426-4434	melanie.filotas@ontario.ca
Horticulture IPM Specialist (tender fruit, grape)	Wendy McFadden-Smith	Tel: 905-562-3833	wendy.mcfadden-smith@ontario.ca
Industrial Crop Specialist	Jim Todd	Tel: 519-426-3823	jim.todd@ontario.ca
Minor Use Coordinator	Jim Chaput	Tel: 519-826-3539	jim.chaput@ontario.ca
New Crop Development Specialist	Evan Elford	Tel: 519-426-4509	evan.elford@ontario.ca
Soil Fertility Specialist, Horticulture	Christoph Kessel	Tel: 519-824-4120 ext. 52480	christoph.kessel@ontario.ca
Pathologist, Horticulture	Michael Celetti	Tel: 519-824-4120 ext. 58910	michael.celetti@ontario.ca
Soil Management Specialist	Anne Verhallen	Tel: 519-674-1614	anne.verhallen@ontario.ca
Surveillance Coordinator	Cora Loucks	Tel: 519-826-3139	cora.loucks@ontario.ca
Soil Sustainability Specialist	Deanna Nemeth	Tel: 905-562-1170	deanna.nemeth@ontario.ca
Tree Fruit Specialist	Amanda Green	Tel: 519-426-1102	amanda.green@ontario.ca
Weed Management, Horticulture	Kristen Obeid	Tel: 519-738-1232	kristen.obeid@ontario.ca

A complete list of Ontario Ministry of Agriculture, Food and Rural Affairs crop advisory staff is available on the OMAFRA website at ontario.ca/crops.

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: 1-877-424-1300

Fax: 519-826-3442

Email: ag.info.omafra@ontario.ca

APPENDIX H: Ontario Ministry of the Environment and Climate Change – Regional Contact Information

Region/County	Address	Telephone/Fax
Central Region Toronto, Halton, Peel, York, Durham, Muskoka, Simcoe	5775 Yonge St., 8th Floor Toronto, ON M2M 4J1	Tel: 416-326-6700 Toll-free: 1-800-810-8048 Fax: 416-325-6345
West-Central Region Haldimand, Norfolk, Niagara, Hamilton-Wentworth, Dufferin, Wellington, Waterloo, Brant	Ontario Government Building 119 King St. W., 9th Floor Hamilton, ON L8P 4Y7	Tel: 905-521-7640 Toll-free: 1-800-668-4557 Fax: 905-521-7820
Eastern Region Frontenac, Hastings, Lennox & Addington, Prince Edward, Leeds & Grenville, Prescott & Russell, Stormont/Dundas & Glengarry, Haliburton, Peterborough, Kawartha Lakes, Northumberland, Renfrew, Ottawa, Lanark, District of Nipissing (Twp. of South Algonquin)	1259 Gardiners Rd., Unit 3 PO Box 22032 Kingston, ON K7M 8S5	Tel: 613-549-4000 Toll-free: 1-800-267-0974 Fax: 613-548-6908
Southwestern Region Elgin, Middlesex, Oxford, Essex, Kent, Lambton, Bruce, Grey, Huron, Perth	733 Exeter Rd. London, ON N6E 1L3	Tel: 519-873-5000 Toll-free: 1-800-265-7672 Fax: 519-873-5020
Northern Region (East) Manitoulin, Nipissing, Parry Sound, Sudbury, Algoma (East), Timiskaming, Sault Ste. Marie	199 Larch St., Ste. 1201 Sudbury, ON P3E 5P9	Tel: 705-564-3237 Toll-free: 1-800-890-8516 Fax: 705-564-4180
Northern Region (West) Algoma (West), Cochrane, Kenora, Rainy River, Timmins, Thunder Bay	435 James St. S., Ste. 331 Thunder Bay, ON P7E 6S7	Tel: 807-475-1205 Toll-free: 1-800-875-7772 Fax: 807-475-1745
Standards Development Branch	Pesticides Section 40 St. Clair Ave. W., 7th Floor Toronto, ON M4V 1L5	Tel: 416-327-5519 Fax: 416-327-2936
Environmental Approvals Branch	Pesticides Licensing 2 St. Clair Ave. W., 12A Floor Toronto, ON M4V 1L5	Tel: 416-314-8001 Toll-free: 1-800-461-6290 Fax: 416-314-8452

APPENDIX I: Other Contacts

Agriculture and Agri-Food Canada Research Centres

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 Rd. 20
Harrow, ON N0R 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

Canadian Food Inspection Agency Regional Offices (Plant Protection)

www.inspection.gc.ca

Belleville
345 College St. E.
Belleville, ON K8N 5S7
Tel: 613-969-3333

Brantford
625 Park Rd. N., Ste. 6
Brantford, ON N3T 5P9
Tel: 519-753-3478

Hamilton
709 Main St. W., Ste. 101
Hamilton, ON L8S 1A2
Tel: 905-572-2201

London
19-100 Commissioners Rd. E.
London, ON N5Z 4R3
Tel: 519-691-1300

St. Catharines
395 Ontario St., PO Box 19
St. Catharines, ON L2N 7N6
Tel: 905-937-8232

Ottawa District
38 Auriga Dr., Unit 8
Ottawa, ON K2E 8A5
Tel: 613-274-7374, ext. 221

Toronto
1124 Finch Ave. W., Unit 2
Downsview, ON M3J 2E2
Tel: 416-665-5055

Guelph
174 Stone Rd. W.
Guelph, ON N1G 4T1
Tel: 519-837-9400

University of Guelph

Main Campus
Guelph, ON N1G 2W1
Tel: 519-824-4120
www.uoguelph.ca

Ridgetown Campus
Ridgetown, ON N0P 2C0
Tel: 519-674-1500
www.ridgetownc.uoguelph.ca

Department of Plant Agriculture
www.plant.uoguelph.ca
Department of Plant Agriculture, Guelph
50 Stone Rd. W.
Guelph, ON N1G 2W1
Tel: 519-824-4120, ext. 56083
Fax: 519-763-8933

Department of Plant Agriculture, Simcoe
1283 Blueline Road, PO Box 587
Simcoe, ON N3Y 4N5
Tel: 519-426-7127
Fax: 519-426-1225

Department of Plant Agriculture, Vineland
4890 Victoria Ave. N., PO Box 7000
Vineland Station, ON L0R 2E0
Tel: 905-562-4141
Fax: 905-562-3413

Lab Services Division
95 Stone Rd. W., PO Box 3650
Guelph, ON N1H 8J7
Tel: 519-767-6299
www.uoguelph.ca/labserv

Trace Organics and Pesticides
Tel: 519-767-6485

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
Fax: 905-562-0084
www.vinelandresearch.com

APPENDIX J: Production Insurance

Production Insurance (PI) covers production losses and yield reductions caused by insured perils. This includes adverse weather, disease, wildlife and insect infestations. Depending on the plan, coverage is available on a total-yield, dollar-value or acreage-loss basis. Producers can choose the type and level of coverage that best meets their needs. When enrolled in PI, producers are guaranteed a level of production, based on their yield history and their chosen coverage level. Claims are paid when an insured peril causes a yield to fall below the guaranteed production.

In Ontario, Agricorp administers PI on behalf of the Government of Ontario and Agriculture and Agri-Food Canada. More than 15,000 producers and 2 million hectares (5 million acres) of Ontario farmland are insured each year.

PI is available to all Ontario farmers, landlords and sharecroppers who grow or manage eligible agricultural products. Coverage is available on many commercially produced agricultural products in Ontario in the following sectors:

- forage
- fresh vegetables
- fruit
- grains and oilseeds
- processing vegetables
- specialty crops

For more information, contact Agricorp.

Agricorp

1 Stone Rd. W.
Box 3660, Stn. Central
Guelph, ON N1H 8M4
Open weekdays, 7 a.m. - 5 p.m.
Tel: 1-888-247-4999
TTY: 1-877-275-1380
Fax: 519-826-4118
Email: contact@agricorp.com
Web: www.agricorp.com

Ontario Agricultural Products Covered by Production Insurance (as of 2017)

General Crops

- barley
- canola
- coloured beans (adzuki, black, cranberry, kidney, Japanese/other)
- corn (conventional, organic options)
- established forage (excess and insufficient options)
- flax
- mustard
- premium new forage seeding (newly seeded hay and pasture)
- oats
- peanuts
- popping corn
- rye
- seed corn
- soybeans (conventional, tofu, natto and organic options available)
- spring grain
- sorghum
- spring wheat
- standard new forage seeding
- sunflower
- white beans
- winter spelt, organic
- winter wheat (soft white, hard white, soft red, hard red, organic options)

Specialty Crops

- bees
- ginseng
- honey
- industrial hemp
- tobacco (black, burley, flue-cured)

Fruit Crops

- apples and apple trees
- cherries (sweet, sour)
- grapes and grape vines
- peaches/nectarines
- pears
- plums
- strawberries

Vegetable Crops – Average Farm Yield or Total Production

- asparagus
- butternut squash (processing)
- carrots (fresh)
- carrots (processing)
- cucumbers (processing)
- green beans and wax
- beans (processing)
- lima beans (processing)
- onions (seed, set, spanish, yellow)
- peas (processing)
- peppers (banana, bell)
- potatoes (fresh)
- potatoes (processing)
- red beets (processing)
- rutabagas
- sweet corn (processing)
- tomatoes (processing)

Fresh Market Vegetables – Acreage Loss Root Vegetables

- carrots
- celeriac
- French shallots
- garlic
- green onions
- leeks
- parsnips
- radishes
- red beets
- rutabagas
- Spanish onions
- sweet potatoes
- turnips
- yellow onions

Leafy Vegetables

- bok choy
- broccoli
- Brussels sprouts
- cauliflower
- celery
- Chinese cabbage
- gai lan
- kale
- lettuce
- mesclun
- spinach
- summer cabbage
- winter cabbage
- yu choy

Fruit Vegetables

- bell and specialty peppers
- cucumbers
- eggplant
- melons
- pumpkins
- squash
- tomatoes
- watermelon
- zucchini

Other Vegetables

- broad beans
- green and wax beans
- green peas
- sweet corn

APPENDIX K: The Metric System

Metric Units

Linear Measures (length)

10 millimetres (mm)	=	1 centimetre (cm)
100 centimetres (cm)	=	1 metre (m)
1,000 metres	=	1 kilometre (km)

Square Measures (area)

100 m × 100 m = 10,000 m ²	=	1 hectare (ha)
100 ha	=	1 square kilometre (km ²)

Cubic Measures (volume)

Dry Measure

1,000 cubic millimetres (mm ³)	=	1 cubic centimetre (cm ³)
1,000,000 cm ³	=	1 cubic metre (m ³)

Liquid Measure

1,000 millilitres (mL)	=	1 litre (L)
100 L	=	1 hectolitre (hL)

Weight-Volume Equivalents (for water)

(1.00 kg) 1,000 grams	=	1 litre (1.00 L)
(0.5 kg) 500 g	=	500 mL (0.5 L)
(0.1 kg) 100 g	=	100 mL (0.1 L)
(0.01 kg) 10 g	=	10 mL (0.01 L)
(0.001 kg) 1 g	=	1 mL (0.001 L)

Weight Measures

1,000 milligrams (mg)	=	1 gram (g)
1,000 g	=	1 kilogram (kg)
1,000 kg	=	1 tonne (t)
1 mg/kg	=	1 part per million (ppm)

Dry-Liquid Equivalents

1 cm ³	=	1 mL
1 m ³	=	1,000 L

Approximate Metric Conversions

5 mL	=	1 tsp
15 mL	=	1 tbsp
28.5 mL	=	1 Imp. fl. oz.

Application Rate Conversions

Metric to Imperial or U.S. (approximate)

litres per hectare × 0.09	=	Imp. gallons per acre
litres per hectare × 0.11	=	U.S. gallons per acre
litres per hectare × 0.36	=	Imp. quarts per acre
litres per hectare × 0.43	=	U.S. quarts per acre
litres per hectare × 0.71	=	Imp. pints per acre
litres per hectare × 0.86	=	U.S. pints per acre
millilitres per hectare × 0.014	=	U.S. fluid ounces per acre
grams per hectare × 0.014	=	ounces per acre
kilograms per hectare × 0.89	=	pounds per acre
tonnes per hectare × 0.45	=	tons per acre

Imperial or U.S. to Metric (approximate)

Imp. gallons per acre × 11.23	=	litres per hectare (L/ha)
U.S. gallons per acre × 9.35	=	litres per hectare (L/ha)
Imp. quarts per acre × 2.8	=	litres per hectare (L/ha)
U.S. quarts per acre × 2.34	=	litres per hectare (L/ha)
Imp. pints per acre × 1.4	=	litres per hectare (L/ha)
U.S. pints per acre × 1.17	=	litres per hectare (L/ha)
Imp. fluid ounces per acre × 70	=	millilitres per hectare (mL/ha)
U.S. fluid ounces per acre × 73	=	millilitres per hectare (mL/ha)
tons per acre × 2.24	=	tonnes per hectare (t/ha)
pounds per acre × 1.12	=	kilograms per hectare (kg/ha)
pounds per acre × 0.45	=	kilograms per acre (kg/acre)
ounces per acre × 70	=	grams per hectare (g/ha)

Liquid Equivalents

Litres/Hectare	Approximate Gallons/Acre	
	Imperial Gallons	U.S. Gallons
50	= 4.45	5.35
100	= 8.9	10.7
150	= 13.53	16.05
200	= 17.8	21.4
250	= 22.25	26.75
300	= 26.7	32.1

Approximate Dry Weight Equivalents

Grams/Hectare		Ounces/Acre
100	=	1 ½
200	=	3
300	=	4 ¼
500	=	7
700	=	10
Kilograms/Hectare		Pounds/Acre
1.10	=	1
1.50	=	1 ¼
2.00	=	1 ¾
2.50	=	2 ¼
3.25	=	3
4.00	=	3 ½
5.00	=	4 ½
6.00	=	5 ¼
7.50	=	6 ¾
9.00	=	8
11.00	=	10
13.00	=	11 ½
15.0	=	13 ½

Handy Metric Conversion Factor

litres per hectare × 0.4	=	litres per acre
kilograms per hectare × 0.4	=	kilograms per acre

Conversion Table – Metric to Imperial (approximate)

Length

1 millimetre (mm)	=	0.04 inch
1 centimetre (cm)	=	0.4 inch
1 metre (m)	=	39.4 inches
1 metre (m)	=	3.28 feet
1 metre (m)	=	1.09 yards
1 kilometre (km)	=	0.62 mile

Area

1 square centimetre (cm ²)	=	0.16 square inch
1 square metre (m ²)	=	10.77 square feet
1 square metre (m ²)	=	1.2 square yards
1 square kilometre (km ²)	=	0.39 square mile
1 hectare (ha)	=	107,636 square feet
1 hectare (ha)	=	2.5 acres

Volume (dry)

1 cubic centimetre (cm ³)	=	0.061 cubic inch
1 cubic metre (m ³)	=	1.31 cubic yards
1 cubic metre (m ³)	=	35.31 cubic feet
1,000 cubic metres (m ³)	=	0.81 acre-foot
1 hectolitre (hL)	=	2.8 bushels

Volume (liquid)

1 millilitre (mL)	=	0.035 fluid ounce (Imp.)
1 litre (L)	=	1.76 pints (Imp.)
1 litre (L)	=	0.88 quart (Imp.)
1 litre (L)	=	0.22 gallon (Imp.)
1 litre (L)	=	0.26 gallon (U.S.)

Weight

1 gram (g)	=	0.035 ounce
1 kilogram (kg)	=	2.21 pounds
1 tonne (t)	=	1.1 short tons
1 tonne (t)	=	2,205 pounds

Pressure

1 kilopascal (kPa)	=	0.15 pounds/in ²

Speed

1 metre per second	=	3.28 feet per second
1 metre per second	=	2.24 miles per hour
1 kilometre per hour	=	0.62 mile per hour

Temperature

$$^{\circ}\text{F} = (^{\circ}\text{C} \times 9/5) + 32$$

Conversion Tables – Imperial to Metric (approximate)

Length

1 inch	=	2.54 cm
1 foot	=	0.3 m
1 yard	=	0.91 m
1 mile	=	1.61 km

Area

1 square foot	=	0.09 m ²
1 square yard	=	0.84 m ²
1 acre	=	0.4 ha

Volume (dry)

1 cubic yard	=	0.76 m ³
1 bushel	=	36.37 L

Volume (liquid)

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

Weight

1 ounce	=	28.35 g
1 pound	=	453.6 g
1 ton	=	0.91 tonne

Pressure

1 pound per square inch	=	6.90 kPa

Temperature

$$^{\circ}\text{C} = (^{\circ}\text{F} - 32) \times 5/9$$

Abbreviations

%	=	percent (by weight)
ai	=	active ingredient
cm	=	centimetre
cm ²	=	square centimetre
e.g.	=	for example
g	=	gram
ha	=	hectare
kg	=	kilogram
km/h	=	kilometres per hour
kPa	=	kilopascal
L	=	litre
m	=	metre
m/s	=	metres per second
m ²	=	square metre
mL	=	millilitre
mm	=	millimetre
t	=	tonne

Emergency and First-Aid Procedures for Pesticide Poisoning

For pesticide poisonings and pesticide injuries, call the Poison Information Centre: Toronto 1-800-268-9017

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.

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.

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.

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- online at ontario.ca/publications
- by phone through the ServiceOntario Contact Centre, Monday to Friday, 8:30 a.m. to 5:00 p.m. ET
- 416-326-5300
- 1-800-668-9938, toll-free across Canada
- 1-800-268-7095 (TTY), toll-free across Ontario

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