

ORCHARD NETWORK

For Commercial Apple Producers

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In this issue...

Orchard Management

Lessons Learned in 2012

Leslie Huffman, Apple Specialist, Harrow

Many growers waited impatiently for this “harvest season” to end. Those who had some crop found high gradeouts due to frost damage, small and misshapen fruit, insect injury and various other ailments, including hail damage.

So is there anything to be learned from this year? Here are some musings to consider:

- **A few degrees make a difference**: Sometimes neighbours have crop beside orchards with few apples, and only reported a degree or two difference of temperature.
- **Orchard site location can be important:** Some orchards close to bodies of water (Lake Erie and Lake Ontario) are carrying a full crop.

(Continued on page 2)

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- **Orchard topography can help or hurt**: There are some blocks with crop near slopes where air kept moving, but flat orchards are often frost pockets.
- **Frost protection works** - ***sometimes***: When an inversion traps warm air above your orchard, use of wind machines and helicopters can warm up orchard air by several degrees. Use of bale burning for smoke cover was helpful in some locations (but care must be taken about local fire regulations). As well, a few small orchards were able to save blossoms with overhead solid set irrigation. But if an inversion is not present, or the temperatures are below a critical level, no protection will work.
- **Cultivars differ in their tolerance to frost**: Ambrosia, Honeycrisp and Golden Delicious seem to tolerate more frost than other cultivars. McIntosh may have good winter cold tolerance, but it doesn't like spring frosts. However, there are some differences between locations, which may be due to tree health or other effects.
- **Rootstocks may affect frost tolerance:** Some growers have more crop in their dwarf orchards than larger rootstocks, and some report the opposite. But it is obvious that trees on M9 size rootstock carry their blossoms closer to the ground, which makes them more vulnerable.
- **Secondary blooms produce disappointing fruit:** Many hoped that secondary blossoms opening after the frost would set a decent crop. However, many of these apples are small and unmarketable. Our normal thinning sprays usually remove these fruit, which is a good thing.
- **Pollination is important:** Many apples have less seeds than normal, or have no seeds. It appears that these apples stopped growing, which is expected, but sometimes we need a reminder.
- **Apple scab development follows the weather:** When green tissue appeared in March, fungicides were needed. Sprayers need to be ready. As well, some growers who reduced their scab program before the end of the primary infection period were stuck chasing scab for the remainder of the season (or will be next year).
- **Petal fall sprays should not be delayed:** With the extended bloom, and worries about frost damage, most growers left beehives later, which delayed the first insecticide. High levels of plum curculio and other insects show the benefit of timely petal fall sprays.
- **Apogee applications can control growth:** Growers who used Apogee report that growth was shortened, and that light penetration into the trees looks adequate to produce good fruit buds for next year.
- **Codling moth takes advantage of low-spray programs:** CM injury has been observed in many fruit. We knew that CM quickly moves into orchards with few insecticides, but this was another reminder. CM mating disruption worked well for some growers this year.
- **Fire blight can be a problem across Ontario**: Fire blight infected open blooms in many areas because conditions were right – including secondary bloom, warm temperatures and moisture.
- **The value of scouting:** When looking for ways to save money on pesticides, monitoring helped growers make better decisions on when to spray or not. Pest pressure varied in many regions with the warm spring triggering early pest emergence, as well as hot, dry weather and low-spray programs causing some insect populations to be higher than expected (eg., leafhopper, codling moth), while others to be virtually non-existent (eg., obliquebanded leafroller, apple maggot).

And last, but not least:

- **Frost is not our only weather risk:** Although spring frost wins the trophy for the most damage this year, hail caused moderate to severe damage to some orchards, as it does every year. Extended dry weather caused stress, especially in combination with above normal temperatures and intense sunshine. We also have trees showing the effect of extreme rains from last year, with early colouring red leaves indicating Phytophthora problems.

Managing Weather Risks

Leslie Huffman, Apple Specialist, Harrow

Weather has influence on many aspects of the business of growing tree fruit, as growers are well aware. When warm temperatures were pushing bud development last March, every grower knew there were risks from frost if the buds pushed into flower development. Some growers invested in frost protection strategies, with results ranging from promising to discouraging. Many are now considering future investments into frost protection. However, there are many weather risks in growing tree fruit in Ontario – which is the most critical for your particular orchard location?

Consider the risk to your orchards from these weather risks:

Too much water: Ontario weather patterns usually create this problem in the spring and fall only. However, in 2011 many orchards dealt with excessive water throughout the entire year. Apples do not like "wet feet", although some newer rootstocks are more tolerant of imperfect drainage and subsequent *Phytophthora* infections. Tree roots standing in water-logged soils during the growing season are at much greater risk than when trees are dormant. Wet soils or potholes also make it challenging for spray or harvest equipment access.

Potential solutions:

- Installation of systematic tile drainage before planting the orchard;
- Use of "French drains" to direct surface water down to tile drains
- Choice of rootstocks tolerant of *Phytophthora*
- Use of cover crops before and during plantings to improve soil structure and drainage
- Avoidance of imperfectly-drained sites, especially clay soils.

Too little water: Rainfall is often insufficient during the growing season to maintain tree health and to produce adequate yields and quality fruit. Water needs of fruit trees are increased under intense sunlight, and incoming solar radiation has been gradually increasing in recent decades. Dwarfing rootstocks have shallow root systems so are more susceptible to lack of rain.

Potential solutions:

- Supplemental irrigation, preferably a permanent trickle system
- Use of under-tree mulch to conserve soil moisture
- Addition of soil organic matter before planting with cover crops or other organic amendments
- Installation of subsurface tile drains which encourage deeper growth of roots, so this helps sustain trees through periods of drought.

Wind: Every year brings severe weather, which often includes strong winds. Wind can cause fruit damage from limb rubs, as well as limb breakage (including the tree leader), or worse, breakage of the graft union. Wind damage can also allow entry of diseases like fire blight. Wind can cause problems with spray coverage and pesticide drift. Tornadoes have caused extensive damage in Ontario apple orchards in the past few years.

Potential solutions:

- Location of windbreaks on windward side of orchards; trees will help protect up to 10 times their height away from the windbreak
- Orientation of rows along path of prevailing winds
- Support the trees (especially leaders) right from planting
- Maximize strength of row trellises, especially the anchors
- Prune trees to allow space for apples to hang away from branches
- Summer prune to remove branches that may cause limb rubs

Hail: The devastation from a short episode of hail has been felt by most tree fruit growers at some time. Hail can either bruise or cut fruit, starting at calyx until harvest. Hail cuts can also allow fire blight infections in leaves and bark (pears and apples) that can lead to death of trees, or removal of limbs.

Potential solutions:

- Hail netting, most useful for high value cultivars
- Hail interruption machines, like cannons, including weather monitoring system on a 24-hour basis
- Production insurance to cushion the economic impact
- Multiple locations of orchards to spread the risk

Intense sunlight: Apple growers in many parts of the world suffer damage from sunlight. UV radiation can cause sunburn on fruit, and sub-lethal injury on leaves. Intense sunlight can cause photosynthesis to slow down or stop, resulting in less manufactured carbohydrates, which can reduce yields and fruit quality.

Potential solutions:

- Use of sunscreen materials like kaolin clay
- Encouragement of leaf growth over fruit to prevent sunburn
- Use of evaporative cooling during the heat of the day (with caution)

Winter injury: Although apples can tolerate colder air temperatures than most tender fruits, they can be damaged by sudden air temperature drops in the fall or very deep cold in the winter. The trunks and limb crotches are the last tissue to harden off in the fall, so may be vulnerable to air temperature changes in November and December. Extreme cold air temperatures, especially after January when trees start to deacclimate, may result in fruit bud damage or dead shoot tips. Infections from powdery mildew also make shoots most vulnerable to cold injury.

Potential solutions:

- Avoid cold sites
- Apply nitrogen only early in the season
- Grow sod or cover crops between rows after July to encourage trees to harden off
- Do not prune in the fall, or early winter
- Use reflective white paint on young tree trunks to avoid southwest injury

Frost: Orchard site and location have a huge influence on the risk from frost. Many orchards are located near the Great Lakes, which tends to slow development in the spring, and delay bloom. Some orchards near Lake Ontario and Lake Erie had full crops in 2012 thanks to this lake effect. However, there were other orchards that were not as lucky. Rolling topography and high elevation are usually beneficial. Location of windbreaks to avoid frost pockets is important as well.

Potential solutions:

- Frost machines to either mix warm air from an inversion (eg. tower fans, tractor-mounted moveable units), or move cold air upwards to prevent ice crystal formation (eg. cold air drains)
- Burning hay bales to create a smoke layer (smudge effect)
- Frost protection with irrigation at low rates
- Orchard heaters.

The frosts of 2012 will only be one of the many weather-related stories for our industry. Be sure to carefully consider all of your weather risks before choosing which mitigation strategy will provide you with the most protection and returns.

Winter Hardiness of New Apple Cultivars of Commercial Importance in Canada

J.A. Cline, University of Guelph, Simcoe; D. Neilsen, G. Neilsen, R. Brownlee, D. Norton & H. Quamme, Agriculture and Agri-food Canada, Pacific Agri-food Research Centre, Summerland, British Columbia

Apples are grown throughout Canada in a wide range of environments which range in hardiness from zone 8a to 5b. Winter injury is a major constraint restricting fruit production and consequently orchards are typically established in close proximity to the moderating influence of large water bodies such as the Great Lakes. Winter injury sufficient to cause damage to apple trees occurs once every five to seven years in western Canada, and perhaps more frequently in eastern Canada. In Ontario and eastern Canada, the most vulnerable period is mid-to late winter, after unseasonably warm temperatures have caused early de-hardening followed by very cold temperatures.

In an attempt to avoid winter injury, one strategy is to grow cultivars that are more resistant to cold. Apple producers are continually searching for new cultivars in response to market demands and to improve orchard profitability. Cold hardiness is not a selection criterion that many breeding programs are focused on. Consequently, considerable risk is taken when establishing new cultivars that have not been fully assessed for their horticultural attributes, regional adaptability, and more specifically, cold/winter hardiness. Furthermore, new restricted-access cultivars, such as 'Minneiska' (SweetTango®), 'Red Prince" and 'Cripps Pink' for example, are not readily available for regional testing by researchers prior to commercial release.

'Honeycrisp', 'Ambrosia', and 'Aurora Golden Gala' are examples of cultivars in Canada that have been established in regions where they may be limited by summer growing conditions (heat units) or extreme minimum winter temperatures. Understanding the winter hardiness limitations of new cultivars, when growing regions differ widely with respect to minimum winter temperatures, is important for long term tree survival and orchard sustainability.

A two-year study was conducted to determine the winter hardiness of new, promising apple cultivars and to determine minimum temperatures at which winter injury can be anticipated. Six new apple cultivars were evaluated for cold hardiness in early December and February for two consecutive winters, and compared with to the traditional cultivars 'Golden Delicious', 'Mutsu' (winter tender) and 'McIntosh' (hardy).

Pieces of dormant current season's shoots were frozen in a series of test temperatures from -20°C to -40°C in a specialized freezer. Ratings of tissue browning in the xylem were used to assess injury after thawing. Winter injury varied significantly among cultivars, but generally not with the time of the dormant period. Overall, the cultivars could be placed in groups based on relative winter hardiness as follows: 'Aurora Golden Gala' (very tender) < 'Mutsu', 'Jonagold', (tender) < 'Ambrosia', 'Golden Delicious' and 'Gala' (intermediate) < 'Northern Spy', 'McIntosh' (hardy), and 'Honeycrisp' (very hardy) (Table 1). These data indicate nearly a 10^{o}C range in winter hardiness amongst the nine cultivars studied, depending on the sampling date. The cultivars, 'Ambrosia' and 'Aurora Golden Gala' appear to be particular winter tender; 'Aurora Golden Gala' appears more tender than 'Mutsu' and Jonagold' while 'Ambrosia' is similar to 'Golden Delicious'– all of which are considered relatively tender in Ontario and British Columbia. 'Honeycrisp' demonstrated the greatest winter hardiness. Based on these finding, it would be prudent to consult long-term climate normal and to take into account the frequency of extreme weather events for potential susceptibility to winter injury particularly prior to establishing the new tender cultivars 'Aurora Golden Gala', 'Ambrosia', and 'Gala'.

Full details of this study appear in *Cline, J. A., D. Neilsen, G. Neilsen , R. Brownlee, D. Norton , H. Quamme. 2012. Cold Hardiness of New Apple Cultivars of Commercial Importance in Canada. J. Amer. Pomology Society 66 (4):174-182.*

Table 1. Predicted hardiness ratings at which minimum temperatures would affect nine apple cultivars. University of Guelph Research Station, Simcoe

Cultivar[y]	Overall mean temperature (°C)		Rank	Hardiness
Aurora Golden Gala	-26.7	a[z]	1	Very Tender
Mutsu	-29.2	ab	2	Tender
Jonagold	-29.7	abc	3	
Ambrosia	-30.4	bcd	4	Inter-mediate
Golden Delicious	-30.6	bcd	5	
Gala	-31.4	cd	6	
Northern Spy	-32.0	cd	7	Hardy
McIntosh	-32.8	d	8	
Honeycrisp	-35.4	e	9	V. Hardy

[y] - cultivars ranked in order of least to most winter hardy

[z] average values with the same letter within a given column are not significantly different according to Duncan's multiple range test at *P* =0.05.

Crop Protection

Apple Scab Resistance Testing

Kristy Grigg-McGuffin, Pome Fruit IPM Specialist, Simcoe; Margaret Appleby, IPM Systems Specialist, Brighton; Leslie Huffman, Apple Specialist, Harrow

Collections this spring completed the 2-year National Apple Scab Fungicide Resistance Testing, which is part of a project administered by the Ontario Apple Growers (OAG). Funding for this project is provided by Agriculture and Agri-Food Canada through the Canadian Agricultural Adaptation Program (CAAP) and the Pest Management Centre, Risk Reduction Program. All apple-producing provinces (Nova Scotia, New Brunswick, Quebec, Ontario and British Columbia) participated again this year, with 19 new Ontario sites randomly selected by the OAG from the five growing districts. In total, 46 sites in Ontario and 107 across Canada were tested for apple scab fungicide resistance (Figure 1).

Cooperating growers agreed to leave 6-8 trees unsprayed for disease until apple scab lesions appeared. Leaves with fresh primary scab lesions were collected and sent to the University of Guelph's Pest Diagnostic Laboratory. There, conidial spores were isolated from the scab lesions and tested for resistance to both sterol inhibitor (SI) (Group 3) and strobilurin (Group 11) fungicides. Two methods for testing were used again this year; a modified SMOR method developed at Cornell University, as well as DNA screening developed at Michigan State University.

The modified SMOR method was altered this year to reduce the risk of contamination, so scab lesions were scraped with a bacteria loop rather than washed to collect isolates. These isolates were then grown in pure isolate colonies for 1-2 months. After this time, plated media treated with either a SI (Nova or Inspire) or a strobilurin (Flint) were inoculated with 10-13 isolates from each orchard and left for 14 days. Relative growth was determined by measuring the diameter of isolate growth in each fungicide treated plate and comparing it to the growth of an untreated control.

DNA screening was also used as the presence of the G143A mutation indicates a high level of resistance to strobilurins (Flint, Sovran and Pristine). This was done using PCR to detect the presence of the G143A fragment in 10 isolates per orchard.

With guidance from Dr. Kerik Cox, Cornell University and Dr. George Sundin, Michigan State University, results were interpreted using baseline relative growth thresholds set to determine the sensitivity levels of scab to Nova, Inspire or Flint.

For Nova and Inspire

- If the relative growth (RG) is **below the baseline susceptible average RG of 35%**, then the population sample is considered *susceptible* to the fungicide.
- If the RG is **between the baseline susceptible average RG of 35% and the resistance threshold average RG of 75%**, then the population has *shifted toward resistance.*
- If the RG is **above the resistance threshold average RG of 75%**, then the population is considered *resistant* to the fungicide.

For Flint (trifloxystrobin)

- If the RG is **below the baseline susceptible average RG of 22%**, then the population sample is considered *susceptible* to the fungicide.
- If the RG is **between the baseline susceptible average RG of 22% and the resistance threshold average RG of 42%**, then the population has *shifted toward resistance.*
- If the RG is **above the resistance threshold average RG of 42%**, then the population is considered *resistant* to the fungicide.

Based on the project results (Figure 2**):**

- For **Nova**, there is a **significant shift from susceptible to resistant populations** in Ontario. The only orchard that is still within the susceptible range is a wild, unsprayed orchard. However, Nova may still be useful for powdery mildew control. Stay tuned for powdery mildew fungicide resistance testing results.

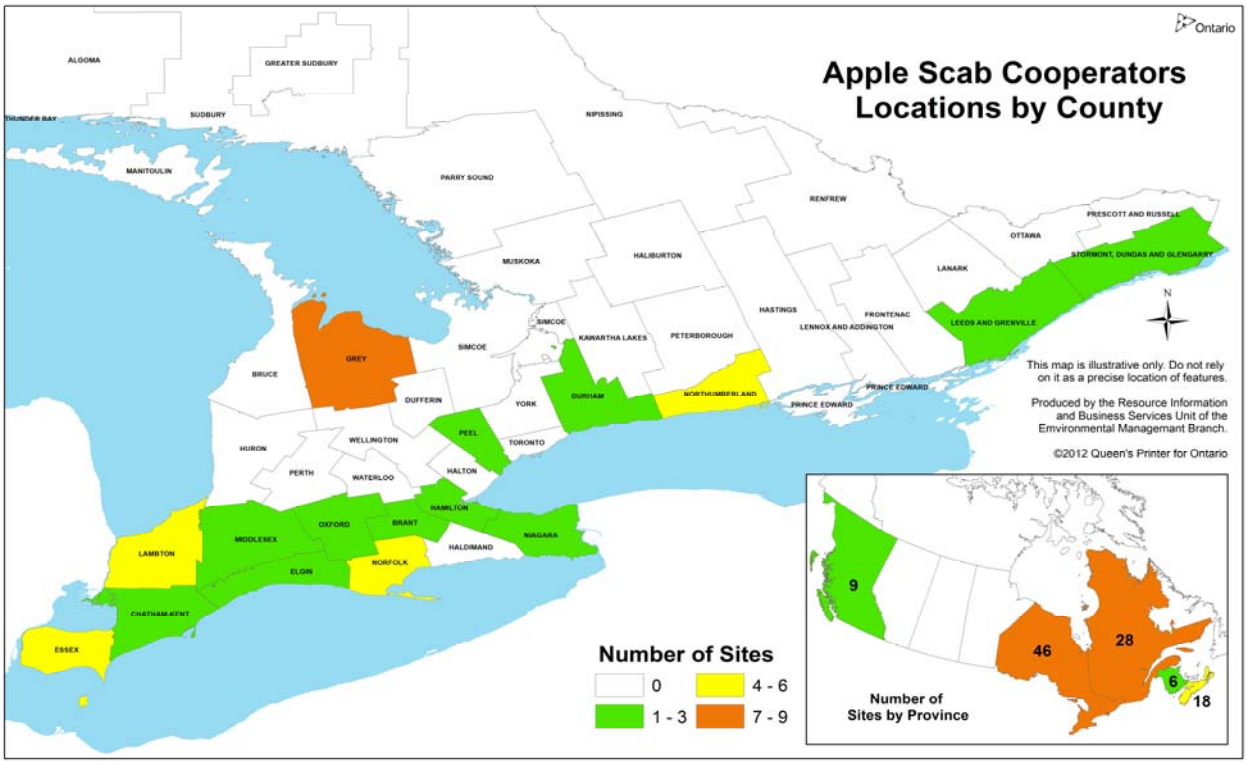

Figure 1. Ontario apple scab co-operator locations by county. Sites were selected as part of the national resistance survey, including British Columbia, Ontario, Quebec, New Brunswick and Nova Scotia. Numbers represent the total apple scab collection sites in each province (inset).

- Many orchards in Ontario are susceptible to the newly registered SI, Inspire (registered for use in 2011). However, there is some indication that populations are beginning to shift towards resistance. **Use Inspire carefully!**
- For **Flint**, there is a **wide sensitivity distribution** in orchards across Ontario, ranging from susceptible to resistant populations. As well, presence of the G143A mutation indicates a high level of resistance to strobilurins (Table 1); however, there may be other genes associated with resistance that we did not test.
- Never use an SI or strobilurin alone, as they can quickly shift to resistant. **Tank mix with a protectant fungicide**. Also, these fungicides should only be used as **preventative** treatment.

It is important to remember, resistance is dependent on how the fungicide was used. Though some orchards in your area may show resistance to a product, don't assume it's in yours! Each orchard needs to be individually tested for resistance and each product needs to be evaluated. Also, although an orchard may be resistant in laboratory tests, it does not mean control failure is occurring in the field. It will eventually fail, however, if use of the product is continued. Testing for apple scab fungicide resistance can be challenging, expensive and, at times, inconclusive. However, it can be a very useful tool to make appropriate control strategy decisions. This testing service is currently being developed at the University of Guelph Pest Diagnostic Laboratory.

In the spring of 2012, we launched the second part of this national project to investigate the resistance in powdery mildew to Group 3 & 11 fungicides. This 2-year project is also funded by Agriculture and Agri-Food Canada through the Canadian Agricultural Adaptation Program (CAAP). Samples of powdery mildew tips were collected from 47 orchards sites from all apple producing provinces, and tested at the Okanagan Tree Fruit Lab in British Columbia. Both bioassay and DNA testing are being used to evaluate the samples and results are expected early 2013.

This is a large and challenging project sponsored in Ontario by the Ontario Apple Growers, with the OMAFRA Apple Team providing leadership. We are hopeful that this project will provide growers with information needed to make fungicide choices, as well as develop the ability in our laboratories to do resistance testing in the future.

This work was in partnership with Ontario Apple Growers, Apple Growers of New Brunswick, Nova Scotia Fruit Growers' Association, Fédération des producteurs de Québec, British Columbia Fruit Growers' Association and the Apple Working Group of the Canadian Horticulture Council.

We gratefully acknowledge Melody Melzer, Shannon Xuechan Shan, Todd Marrow and Gabe Ho at the Pest Diagnostic Laboratory.

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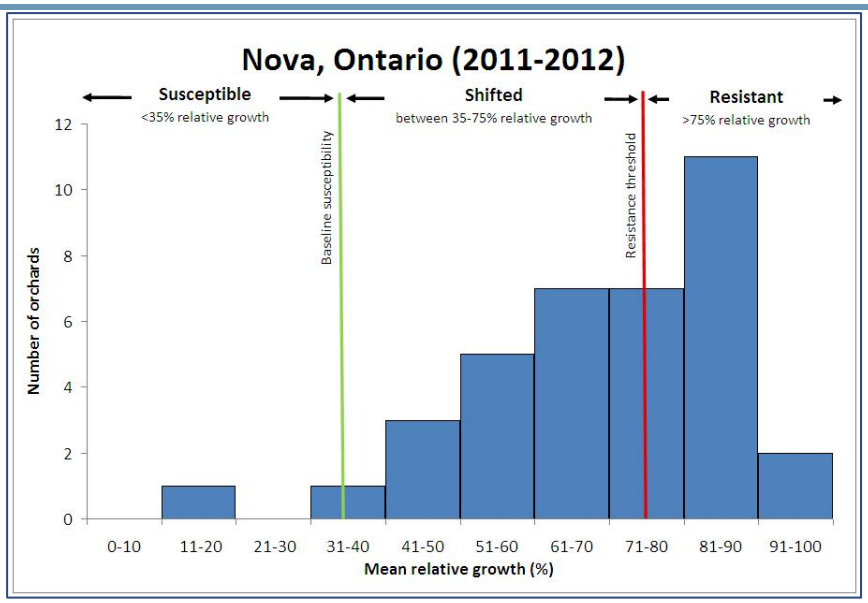
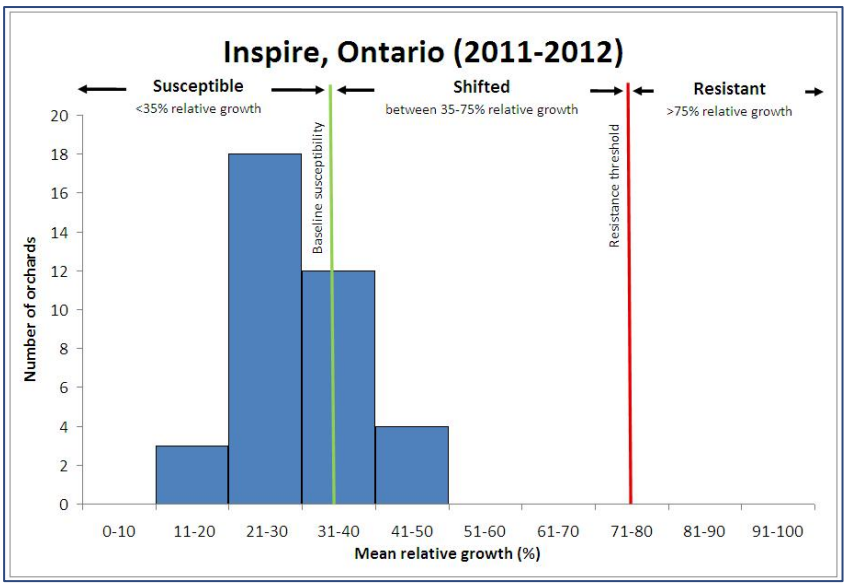




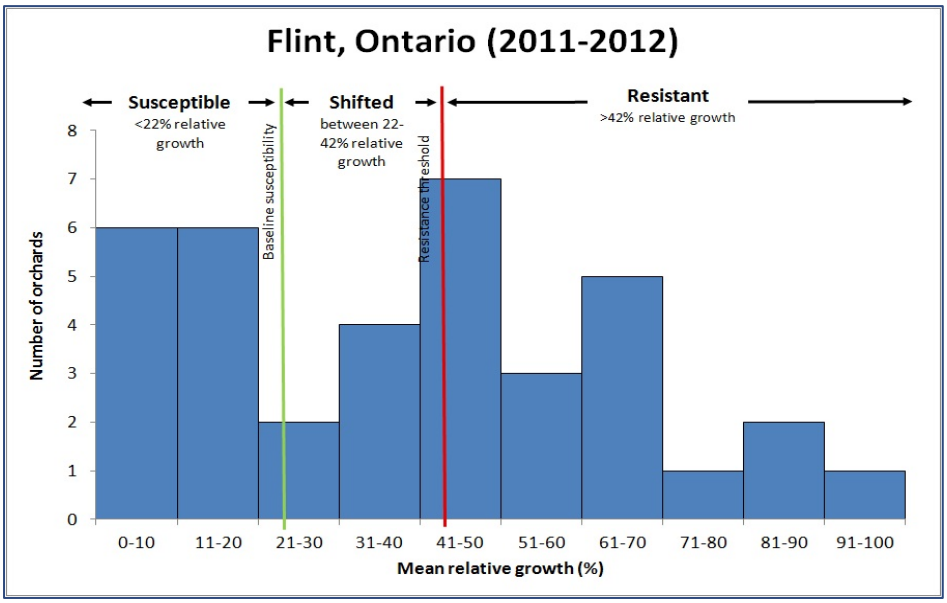


Figure 6. Fungicide sensitivity for apple scab populations from 37 Ontario orchards surveyed in 2011-2012.

Table 1. Presence of the G143A mutation associated with strobilurin (Flint, Sovran, Pristine) resistance from Ontario orchards

County	# sites tested	# sites w/ G143A	# isolates tested / site	% resistant isolates / site
District 1	**11**	**10**	**10-25**	**10-100**
Essex	5	5	10	10-100
Kent	1	1	10	20
Lambton	3	2	10-25	48-90
Elgin	2	2	10-24	40-100
District 2	**6**	**4**	**10-25**	**10-100**
Norfolk	5	3	10-25	10-100
Brant	1	1	10	70
District 3	**9**	**4**	**10-25**	**50-100**
Grey	9	4	10-25	50-100
District 4	**4**	**3**	**9-10**	**10-90**
Hamilton	1	1	9	89
Niagara	3	2	10	10-90
District 5	**10**	**4**	**10-24**	**4-50**
Durham	3	1	10-24	4
Northumberland	5	2	10-14	10-50
Leeds & Grenville	1	0	10	n/a
Stormont, Dundas & Glengarry	1	1	10	40
TOTAL	**40**	**25**	**10-25**	**10-100**

Glomerella Leaf Blotch and Bitter Rot in Ontario Apples

Michael Celetti Plant Pathologist (Hort Crops), Guelph; Kristy Grigg-McGuffin, Pome Fruit IPM Specialist, Simcoe

Unusual spots and blotches on apple leaves were observed late July and August this summer, particularly on Golden Delicious and Gala. During this same time, researchers in West Virginia and New York were also observing similar symptoms. This disease was identified as Glomerella leaf blotch (GLB), a similar pathogen as the bitter rot fungus that infects fruit.

On leaves, GLB first appears as small reddish to brown spots, similar to frog-eye leaf spot (Figure 1). Unlike frog-eye leaf spot, which only expands a few millimetres and remains circular, GLB lesions often join to form irregular brown blotches. Diagnostic features of GLB are concentric rings inside the leaf lesions that have a "wood grain" appearance (Figure 2). Often severely infected leaves turns yellow and fall prematurely (Figure 3). Leaf symptoms were commonly mistaken for necrotic leaf blotch. However, symptoms of GLB are throughout the canopy, on both old and new growth. Necrotic leaf blotch appears on mature leaves of rapidly growing shoots. As well, unlike necrotic leaf blotch where yellow blotches appear initially and browning occurs prior to defoliation, GLB develops brown patches first, followed by yellowing.

Infection of fruit (bitter rot) can occur at any time after petal fall. However, most severe fruit infections occur between midseason and harvest. Early infections appear as sunken grey or brown spots (Figure 4). Depending on when these symptoms appear, bitter rot lesions were sometimes confused this year with bitter pit or lenticel breakdown (Figure 5). Bitter pit causes a tissue breakdown, resulting in slight depressions with dry, spongy tissue, generally at the calyx. In some instances, symptoms are not apparent, or very faint on the fruit surface, but appear under the skin.

Lenticel breakdown usually appears after harvest and/or upon removal from storage, and appear as darkened or black lenticels, surrounded by small brown spots. However, the spots are usually only skin deep with no corking of the flesh.

Often on yellow skin varieties, such as Golden Delicious, a red hallow surrounds the bitter rot lesions. These spots can be confused with San Jose scale fruit injury (Figure 6). However, scale injury is most abundant around the calyx, with a grey patch in the centre of the inflamed area.

During wet or humid conditions, orange to salmon coloured spores are produced on the expanding bitter rot lesions (Figure 7). As the lesions enlarge, a diagnostic V-shape rot can be observed progressing towards the core when infected fruit are cut open, which distinguishes it from black rot and blue mold (Figure 8).

Both GLB and bitter rot are more common in the southern US, where significant fruit damage can occur. Warm to hot weather early in the growing season, much like what we experienced in Ontario, favours development. Only time will tell if this disease will become more prevalent in temperate climates, such as southern Ontario and north-eastern US.

Management begins with good orchard sanitation. Removing mummified fruit and mulching or removing rotten fruit on the orchard floor will remove primary inoculum. Some fungicides registered for apple scab and summer diseases may provide protection from GLB and bitter rot. However, more research into managing these diseases in temperate climates is required. A survey is planned for 2013 to determine the distribution of GLB and bitter rot in Ontario.

Figure 1. Glomerella leaf blotch (left) first appears as small spots that may look similar to frogeye leaf spot (right).

Figure 2. Glomerella leaf blotch lesions expand and form irregular brown blotches with concentric rings that give a "wood grain" appearance.

Figure 3. Remaining tissue of leaves severely infected with Glomerella leaf blotch turn yellow and fall prematurely

Figure 4. Early bitter rot infections on fruit appear as sunken grey or brown spots.

Figure 5. Bitter rot can sometimes be confused with bitter pit (left) or lenticel breakdown (right)

Figure 6. On yellow skin varieties, a red halo may develop around the bitter rot lesions (left), which can be mistaken for San Jose scale injury (right)

Figure 7. During wet or extreme humid conditions, masses of orange or salmon coloured spores are produce on the surface of bitter rot lesions.

Figure 8. Bitter rot has a diagnostic V-shape rot that can be observed progressing towards the core when infected fruit are cut open.

New Detections of Brown Marmorated Stink Bug in Ontario

Hannah Fraser, Entomology Program Lead, Vineland

In the last issue we reported an established population of brown marmorated stink bug (BMSB) had been detected in Hamilton, Ontario. Hundreds of nymphs and adults were found in buckthorn located within a wildlife sanctuary and along parts of the Niagara Escarpment. BMSB has not yet been detected in crops (Figure 1).

This insect seeks shelter from the cold, and often ends up overwintering in buildings. We anticipated getting lots of calls from homeowners, based on the numbers observed outdoors. Sure enough, when the days started to chill down in late September and early October, adult BMSB began to move indoors and the calls / emails came in to the OMAFRA Agriculture Information Contact Centre. Although the majority of specimens were collected in Hamilton, we had over thirty finds scattered all over Burlington, which most likely indicates BMSB is established there as well. Many of those reporting BMSB had multiple individuals and indicated they've been seeing them for 3 or 4 years. Adults were also collected at one location in Toronto, and the same homeowner from Newboro who had submitted a specimen in the spring found additional specimens this fall.

The majority of the Hamilton specimens are showing up along the Escarpment. A likely reason for this is because this part of the city is heavily forested, and it contains many of the woody non-crop hosts that BMSB use through the season such as Tree of Heaven, catalpa, maple ash, etc. (and apparently buckthorn). BMSB populations can build up in these unmanaged areas.

Populations of BMSB tend to become established in urban areas first then disperse to agricultural crops. The abundance of suitable landscape hosts and proximity of BMSB populations pose a serious immediate risk to adjacent agricultural areas where apples are produced including Brant, Halton, Hamilton and Niagara counties. Growers in these areas should be particularly vigilant about monitoring for BMSB.

To date, there have been three products registered for use against BMSB, and a national technical working group has been established to prioritize research needs, including potential management solutions.

Early detection is important to the long term success of management programs. We need to have a better understanding of where this pest is and how well it is established. There is a monitoring network for this pest; however, we have a better chance of finding pockets of small populations if more people are actively looking. Tracking the distribution and spread is essential.

If you think you have found BMSB, contact the Agriculture Information Contact Centre at 1-877-424-1300 or email ag.info.omafra@ontario.ca, and we will provide you with instructions on what to do with the sample (high resolution pictures are useful).

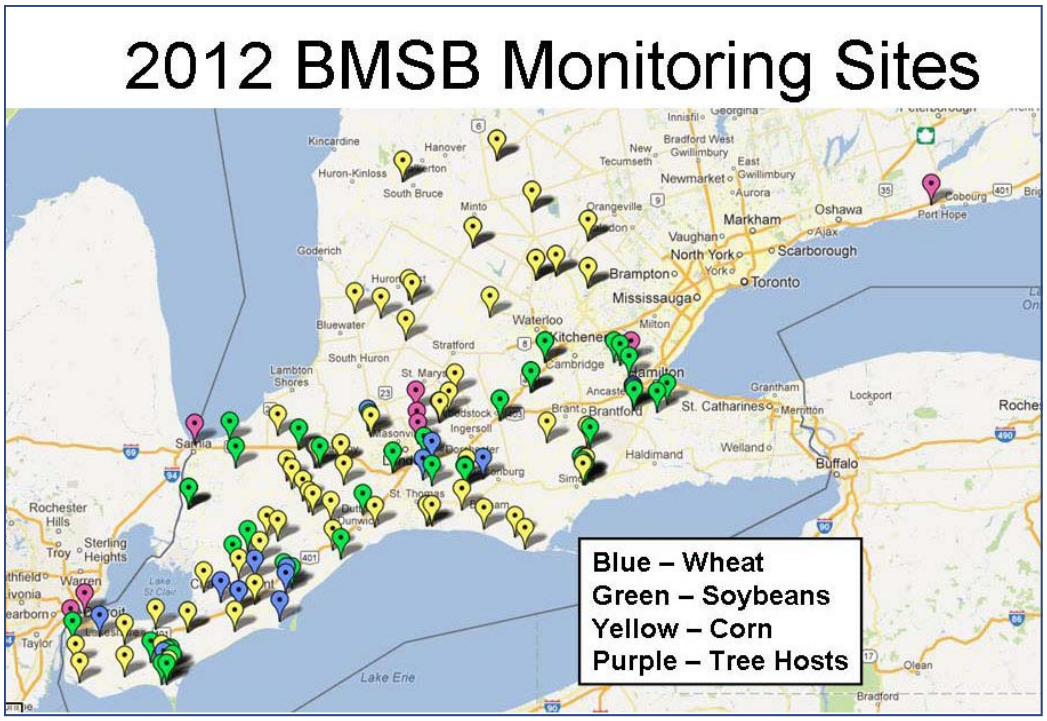


Figure 1. 2012 BMSB Monitoring Sites

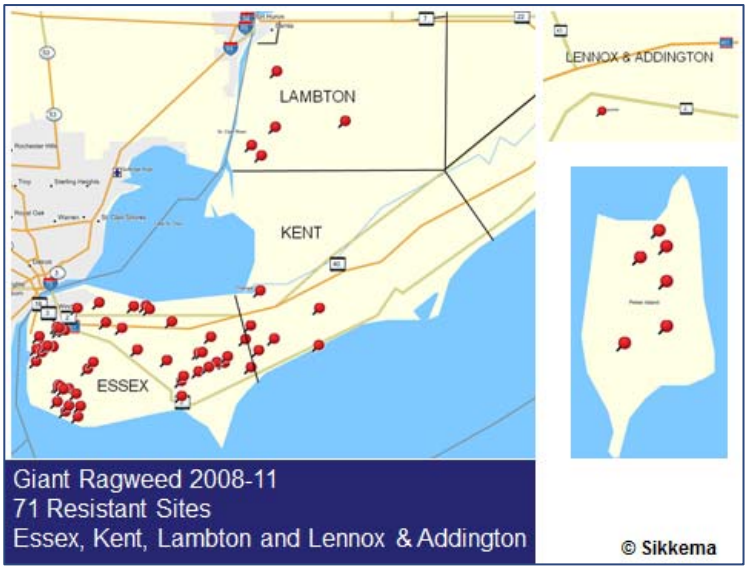
Glyphosate Resistant Weed Update

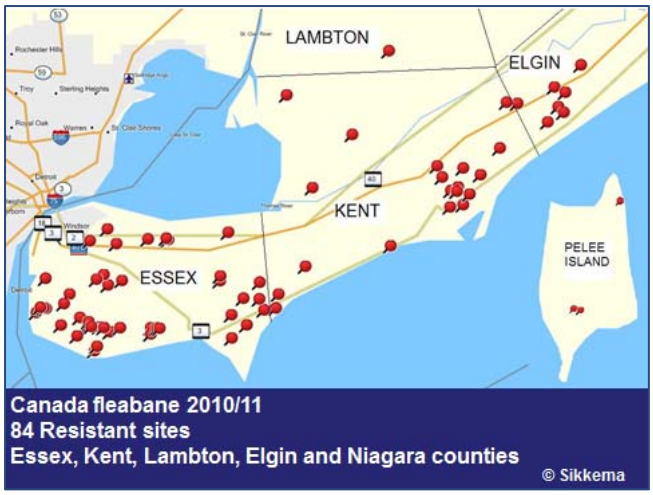
Kristen Callow, Weed Management Program Lead - Horticulture, Harrow

There has been a lot of work conducted by Dr. Peter Sikkema, Dr. François Tardif and many graduate students (Joe Vink, Holly Byker, Joanna Follings) at the University of Guelph to determine the extent of glyphosate resistant weeds in Ontario and potential management options.

Currently, there are three species with resistance to glyphosate in Ontario, giant ragweed since 2008 (71 locations), Canada fleabane since 2010 (84 total locations) and common ragweed (1 location).

- Glyphosate resistant giant ragweed has been confirmed in Essex, Kent, Lambton and Lennox Addington counties. Three of these sites have confirmed multiple resistance to Group 9 (glyphosate) and Group 2 (cloransulam).
- Glyphosate resistant Canada fleabane has been confirmed in Essex, Kent, Lambton, Elgin and Niagara counties. Five of these sites have confirmed multiple resistance to Group 9 (glyphosate) and Group 2 (cloransulam).
- Glyphosate resistant common ragweed has been confirmed in Essex County.





What does this mean for horticulture producers?

Half of the 24 glyphosate resistant weeds worldwide have been found in perennial cropping environments, specifically orchards. The glyphosate resistant weeds currently in Ontario could very easily become problems in horticulture crops. If you suspect resistance get your weeds tested, do not wait years to verify. Confirmation testing is confidential and free of charge: www.plant.uoguelph.ca/resistant-weeds/ or contact kristen.callow@ontario.ca and please, please, please do not let suspect weeds go to seed. Plan your herbicide program based on weed species and suspected resistance.

Giant ragweed in soybean

Mature Canada fleabane in soybeans

The future: fields with more than one glyphosate resistant weed species

Airblast Sprayer Wheel Maintenance

Dr. Jason S.T. Deveau, Application Technology Specialist, Simcoe; Mr. Murray Thiessen, Consulting Agricultural Mechanic

Airblast sprayer wheel assemblies should be cleaned and inspected as part of regular annual maintenance. Wheel bearing maintenance before long-term storage may prevent water from corroding the bearings. The exploded diagram (see Figure 1) details the parts found in a typical wheel assembly.

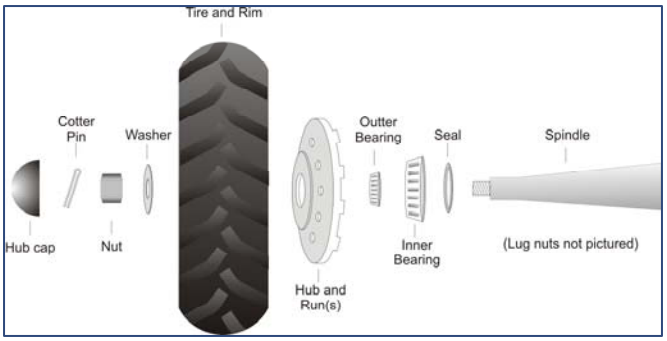


Figure 1 - Exploded diagram of airblast sprayer wheel assembly

The following procedure was performed on a 2012 Durand-Wayland® sprayer, but the steps are applicable to most sprayer makes and models. The entire process should take approximately half-an-hour per wheel.

Step 1

Empty the sprayer and park it in a well-lit, level spot. Un-hitch the tractor and raise one side of the sprayer using a bottle or floor jack to clear the wheel. Secure the sprayer with a jack stand.

Step 2

Remove the lug nuts and take the wheel off the hub. Do not remove the wheel and hub together because it is heavy and you might bang the delicate seal on the spindle. Check the wheel rim for signs of corrosion or distortion (often caused by either loose or over-tightened lug nuts). Check the tread for wear or cuts and check the tire pressure.

Step 3

Remove the hub cap and pull out the cotter pin. Then remove the nut and washer that hold the hub on the spindle. Put all the small parts in a plastic container with some de-greaser (e.g. Varsol®) to clean the parts and keep them from getting lost.

Step 4

Knock out the seal and hub bearing and put them in the plastic container. Unless it is damaged, there should be no need to remove the bearing cup (or race) from the hub. The seal is designed to keep dirt out of the assembly, not to keep grease from escaping. Be sure to note which way it is facing. The seal is often ruined during disassembly; have a replacement on hand.

Step 5

Clean the old grease out of the hub. This hub has too much and it has filled much of the air space (or cavity) within the hub. That air space is provided so grease is not forced out as the hub heats up, and so dirt is not pulled in as the hub cools. Note the colour of the grease – if it is black and stains your hands, it has burned because too much grease has caused overheating. Look for evidence of dirt or water in the bearing, which indicates seal failure.

Step 6

Wipe dirt from the spindle. Never pressure-wash wheels when they are on the spindles because the spray drives dirt and water past the seal and into the hub. Inspect the sealing surface of the spindle for damage or wear.

Step 7

Clean the seal thoroughly. Seals are easily damaged and may need replacement.

Step 8

Clean the hub bearing. Compressed air is a good way to get all the old grease out, but do not spin the bearing with the air.

Step 9

Look for scratching, pitting or blue metal (indicating heat). This scorch mark indicates the bearing was moving on the spindle, and the friction created heat. Agricultural wheel bearings do not fit tight to the spindles. If there is too much clearance, the bearing race will turn on the spindle where it is not supposed to.

Step 10

Repack the bearings, reassemble the hub and re-grease the hub. Bearings should only be ~40% full. Too much grease creates heat and does not let the bearing roll properly. Too little increases friction. No matter which grease you choose to use, never combine greases; They may not be chemically compatible.

Step 11

Mount the hub tightly on the spindle. Replace the washer, cotter pin, nut and cap. There is no need to bend the arms of a cotter pin all the way back – it weakens the metal. Just bend one arm to 90° and cut off the excess. Use anti-seize on the wheel pilot to make the rim easier to remove next time.

Step 12

Replace the wheel and rim. Do not grease the lug nuts or they might loosen. Over- or under-torqueing lug nuts can cause damage. Look in the manual for your correct torque and consider using a torque wrench. Tighten the nuts in a star-shaped pattern – not sequentially.

Repeat process on the other wheel.

For more information on bearings and bearing maintenance, go to:

http://www.timken.com/en-us/products/Documents/Industrial-Bearing-Maintenance-Manual.pdf

Special thanks to Ben Noordam, Dan DeVries and Paul Splinter for their assistance in creating this article.

What Ever Happened with that Biofumigant Cover Crop for Apple Replant Project?

Anne Verhallen, Soil Management (Hort Crops), Ridgetown; Leslie Huffman, Apple Specialist, Harrow

In the spring of 2010 we started an OMAFRA funded project looking at using biofumigant cover crops in tomato production and during apple orchard renovation for replanting. Three apple replant sites were established that spring. A full suite of soil samples were taken before cover crop establishment for fertility, nematodes, disease pests and soil health and analyzed at A&L Laboratories in London. The nematode results did not indicate significant numbers of nematodes present in any of these locations probably as a result of tillage and timing of sampling. The samples were also analyzed for the presence of a number of disease organisms including Verticillium, Fusarium, Colletotrichum, Phytophthora, Pythium and Rhizoctonia.

Mustard and pearl millet cover crops were grown over the summer 2010 and worked into the soil. The treatments within the plots were re-sampled in the spring of 2011 just before the new trees are established. We continue to monitor the early growth of the apple trees to determine the impact of the biofumigant treatments. Recently we were out measuring tree diameters. The data is being collected and analysed. There will be a further update in the next newsletter.

For more information on this project contact:

Anne Verhallen – project lead anne.verhallen@ontario.ca
Leslie Huffman – apple specialist leslie.huffman@ontario.ca

Thanks to our measuring crew of Jason Deveau, Kristy Grigg-McGuffin and Sadie Miller for braving the cold to help us collect all that data.

Watch For Rodent Damage in The Orchard This Winter

Kristy Grigg-McGuffin, Pome Fruit IPM Specialist, Simcoe

With the snow beginning to fall, this time of year brings the return of rodents back into the orchard. Every year, voles (mice) and rabbits can cause significant economic injury. Look for indications of rodents in the orchard, such as girdling of bark, burrowing, droppings, or chewed apples. Though often kept in check by their many natural predators, populations can increase quickly, making controls important to reduce damage. Some growers this year minimized their year-end orchard maintenance, opting to leave fruit in the orchard or cut back on late season mowing of long grasses and cover. These can provide the foodsource and protection from predators these pests need.

There are a number of management options to consider:

- Mow grass to 8-15 cm. Avoid using a sickle-bar mower, which may produce a thatch layer that provides cover for voles.
- Remove all mulch, prunings, apples and other debris around the base of trees, in tree rows or adjacent to the orchard.
- Mouse guards can be used to protect the bark of newly planted trees from vole damage. Keep in mind, when snow is deep, mouse guards generally don't give protection against rabbits.
- Paint trunks and lower scaffolds with white exterior
- latex paint and thiram to repel rabbits –though there is some uncertainty about long-term efficacy.
- While trapping is not effective for controlling high
- populations, it can be used to monitor or control small populations.

Where cultural practices are insufficient, toxic baits are available for use against mice in orchards. See OMAFRA Publication 360: Guide to Fruit Production for a list of baits registered for use in orchards. Always speak to your local Ontario Ministry of Natural Resources office and check the label to ensure the product can be legally used. Growers and landowners are responsible for ensuring all relevant legislation is followed. Contact the Ontario Ministry of Natural Resources for more information.

For more information on management options, refer to Publication 310: IPM for Apples, or Rodent and Deer Control in Orchards (OMAFRA Factsheet Order No. 98-023).

Figure 1: Rodent damage

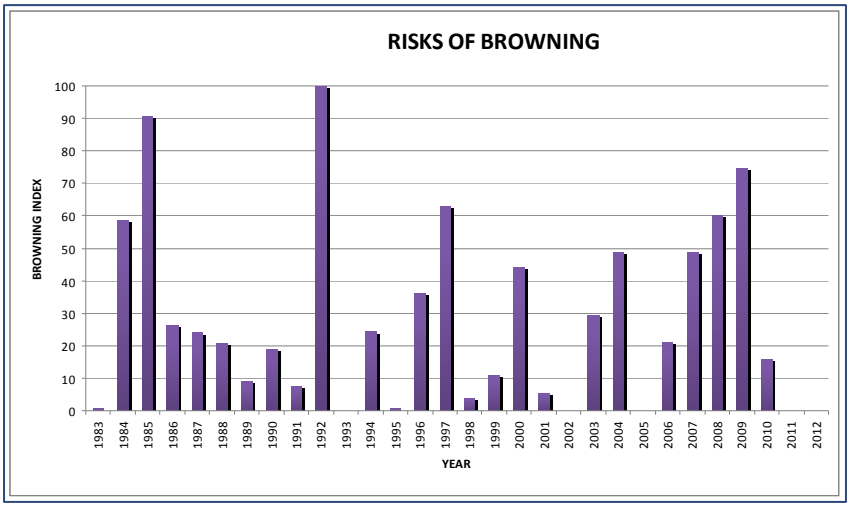
Figure 2: Rodent hole

Postharvest

Low Risk of Chilling Disorders for 2012-13 Season in Ontario

Dr. Jennifer DeEll, Fresh Market Quality Program Lead, Simcoe

CIPRA is a computer-based program developed by the research team of Dr. Gaétan Bourgeois (AAFC-QC) that uses weather data to predict the risk susceptibility of apples to specific storage disorders (Bourgeois, DeEll, and Plouffe). According to the CIPRA program, the figure below shows the results from 1982 to 2012 using weather data from **Norfolk County, Ontario**.



The model indicates that there is **<1% risk of chilling-related disorders developing during the 2012-2013 storage season** (i.e. flesh browning, low temperature breakdown, soft scald)**.** Although the risk is low, it is still important to use the recommended storage temperatures for all cultivars. 'Empire', 'McIntosh', and 'Honeycrisp' are especially susceptible to chilling-related disorders and the symptoms can always be induced by using storage temperatures lower than optimum. Harvesting past optimum maturity can also promote these disorders.

Announcements

Apple Program: Ontario Fruit & Vegetable Convention 2013

Thursday, February 21, 2013

Growing Quality Apples at Columbia Fruit Packers
Tim Welsh, Horticulturalist, Wenatchee
Postharvest Research Results and New Storage Technologies Dr. Jennifer DeEll, OMAFRA
. **Panel: Technology Choices for Apple Production:**
Platforms: Pete Geerts, Arkona
Frost fans: Dan Devries Fenwick
Harvest Aid: Werner Zurbuchen, Simcoe
Tall Spindle Orchards/Irrigation: Paul Frankis, Kingsville
Lunch & Trade Show

Can You Adapt to the Threat of Spring Frosts?
Mark Longstroth, Michigan State University
What's New in Fire Blight control?
Dr. George Sundin, Michigan State University
Times They are A-changing': Changes in Ontario Apple Pest Complex
Kristy Grigg-McGuffin, OMAFRA
The Washington State Apple Industry
Tim Welsh, Columbia Fruit Packers

Calling all Ontario Cider Producers

Last year, at our **2nd Annual Ontario Sweet Cider Competition, o**ur judges chose the best cider by Al Ferri and Sons, and Ray will share his story at our workshop.

Despite the tough year, we hope for more entries at the **3nd Annual Ontario Sweet Cider Competition** at the Ontario Fruit & Vegetable Convention, on **February 20, 2013**. Bring two 4L jugs of your cider on Feb. 20 to the Niagara Falls Convention Centre. All Ontario cider makers can enter, including those using a custom presser. Plan to attend thisworkshop too.

Apple Cider Workshop (Sweet and Hard Cider), February 20, 2012, 9:30 am.
The Quebec Apple Cider Industry
Hubert Philion, Vergers Écologiques Philion, Hemmingford, Quebec
Making Winning Cider at Al Ferri & Sons
Ray & Jim Ferri, Brampton, Ontario
More Than Meets the Eye: Assessment of Cleaning and Sanitation Practices
Dr. Robert Blenkinsop, Food Scientist,OMAFRA
Making Specialty Ciders at Vergers Écologiques Philion
Hubert Philion, Hemmingford, Quebec
Cider judging is open to the public on Feb. 20, (afternoon). Winning entries will be announced on Feb. 21, and will be available to taste.

Food Safety Snippet

On Farm Food Safety: Your Business Advantage Instructional Posters for On-Farm Food Safety

Ontario Ministry of Agriculture, Food and Rural Affairs' (OMAFRA) has developed a series of Good Agriculture Practices posters that are available **free of charge** to producers.

The posters are 8 ½ x 11" in size and available in English/Spanish or French/Spanish versions. They are rip and weather resistant making them durable enough to use in and around your farm.
The posters provide visual instructions for best practices on a variety of topics, including:

- Hand Washing
- Proper use of hand sanitizers
- Food Handling
- Proper toilet use
- Food storage and packaging
- Transportation
- Proper use of animal health products

Food safety practices contribute to competitive, productive and sustainable agri-food business. For more information and to see our posters, visit the Ontario Ministry of Agriculture Food and Rural Affairs website at www.ontario.ca/goodagpractices or call us to order your posters, 1-877-424-1300.

Agricultural Information Contact Centre: 1-877-424-1300
E-mail: ag.info.omafra@ontario.ca
Northern Ontario Regional Office: 1-800-461-6132

www.ontario.ca/omafra