

ORCHARD NETWORK

For Commercial Apple Producers

VOLUME #16, ISSUE #1 February, 2012

In this issue...

Orchard Management

Pruning for Uniformity

Leslie Huffman, Apple Specialist, OMAFRA Harrow

High density orchards have remarkably uniform trees. This **uniformity leads to similar pruning** needs in various areas of the tree. Making the same cut, tree after tree, is very easy to teach to your workers. Take an opportunity to watch a pruning crew working on a platform - the tasks in different areas of the tree are divided, with each worker making basically the same cut. **Efficiency in pruning** comes when a worker seldom pauses to make a decision.

We've been looking at many high density orchards, trying to learn how to grow trees in the newer systems like Tall Spindle. Think about what you observe in trees in new orchards:

- a single tall, straight leader
- no scaffolds with a diameter greater than 50% of the leader
- upper parts of the tree narrower than the bottoms
- light penetration into the tree

(continued…)

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- singular branches grown as individual columns – no branching allowed
- laterals or scaffolds growing horizontally with moderate annual growth
- fruiting area throughout the entire tree
- fruiting area exposed to the sun (and within easy reach of pickers)
- strong fruiting structures with a mixture of fruiting and resting spurs fed by short dards (short branches around the spurs)

Each of these features is desirable in conventional orchards as well as high density trees, because they lead to calm trees growing high yields of quality fruit.
For this reason, we should strive to make our conventional trees as uniform as possible, and increase the efficiency of pruning.

High density orchards have a **higher proportion of fruiting wood** compared to older orchards. One principle of some high density systems is removing stronger wood each year. This practice can also work in conventional trees, gradually increasing the amount of fruiting wood in your trees. **Start by removing a large scaffold** in the top of each tree, Plan to continue removing scaffolds each year over a 3-5 year period. This will encourage smaller fruitful wood to grow in these open areas, and eventually shift the tree to more fruit & less wood.

While many growers have planted new high density orchards, most are still managing acres of conventional trees, and will continue for a while yet. Adopting the practice of whole scaffolds removal, singulating all scaffolds, and pruning to allow sunlight penetration, will make older orchards more productive and efficient. Until all those new orchards come into production…..

Danger: Top-Heavy Trees

Leslie Huffman, Apple Specialist, OMAFRA, Harrow

Our goal is to grow apple trees that are dominated by a tall leader. The dominance of the leader starts by planting a taller tree and not heading it. Dominance is encouraged by supporting it on a stake or trellis, and by removing shoots competing with the leader. However, it is a continuous challenge to maintain the leader, and must be your first goal in pruning a tree.

Any branch that is more that 50% of the diameter of the leader will reduce the leader's dominance, and **should be removed**. This is not a new concept, but it needs to be reinforced every pruning season. Branches in the upper part of the tree are especially prone to heavy growth because they get more sunlight.

It works well to have someone walk ahead of the crew with a pole saw, and remove any branches that exceed this 50% rule. It may appear that large amounts of wood and fruit spurs are being removed, but it keeps the balance between growth & fruit, and encourages the fruiting area lower in the tree.

Carry-Over Effects of Mild Winter Temperatures on Apple Yields

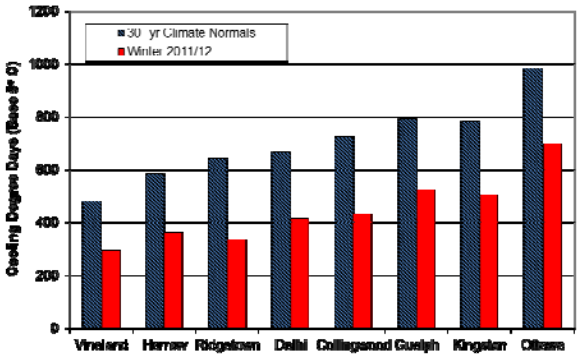
Dr. John Cline, Associate Professor, Pomology, University of Guelph, Simcoe

It didn't come with great surprise that Ontario's prognosticating rodent Wiarton Willie has forecasted an early spring. Although spring hasn't yet arrived on the calendar, the weather suggests otherwise. Low snowfall levels and unseasonably warm weather have made dormant pruning much easier for Ontario apple growers. Some might be wondering what effect the atypically warm winter temperatures have and will have on the 2012 growing season – specifically fruit growth, development, and yield. Understandably, relatively little attention has been devoted

to answering this question in Canada in the past. However ten years ago, in 2001-02, we were faced with even warmer winter temperatures.

How much warmer than 'normal' has the winter of 2011-12 been? To answer this, I calculated the number of cooling degree days (similar in concept to growing degree days except it is an expression of the total cold accumulation below 5°C) for eight apple growing locations throughout Ontario from October 1, 2011 to January 31, 2012. (Fig.1). These data indicate that the total accumulation of 'cold' is approximately 52-71% of 'normal', depending on location. That is to say that we are 39-48% warmer than the 30-year average. For example, the total cold accumulation in Ottawa this past winter is comparable to that typically experienced in Delhi in a 'normal' year. Furthermore, the total cold accumulation in Vineland and Harrow has been approximately 60% of that 'normally' experienced. While these observations clearly support the phenomenon that our climate is becoming warmer and weather more variable, has this 'warm' winter been detrimental in terms of tree fruit production?

Figure 1.
Cooling Degree Days for the Winter of 2011/2012 in Comparison with Climatic "30-yr Normals" for Several Locations in Ontario



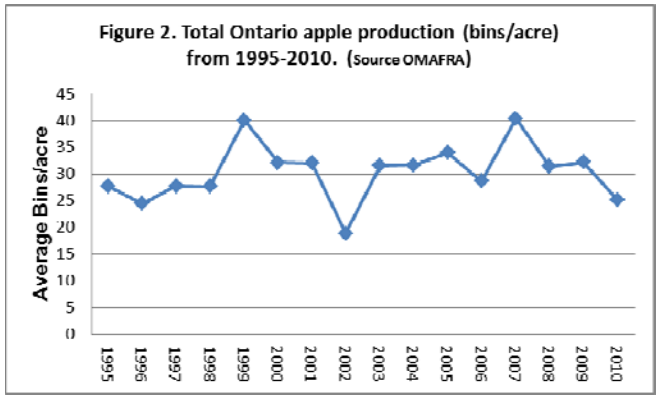
The horticultural literature in Europe has noted that winter climatic conditions can be a major source of variation in annual apple and pear yields. Apple trees can be affected by an atypically warm winter by above average early spring temperatures prior to bloom. This results in higher heat accumulation and advanced phenology (bud development) resulting in earlier blossoming and a greater risk of frost. This occurred in the warm winter and spring of 2001-02. Early bloom may also result in poor pollination because of unfavourable weather and bee activity during blossoming. These factors combined will result in lower fruit set and reduced yields.

Less is known about the negative effects of warmer conditions during late fall, winter and early spring. It is well recognized that the most importance physiological process for a temperate fruit crop during the winter period is hardening dormancy. After trees drop their leaves in the fall, they go into a state known as dormancy. As the winter progresses the trees go into another state known as rest, during which they cannot grow even if environmental conditions are favorable for tree growth. Exposure to cool temperatures is necessary to overcome this period of rest, after which normal bud break and growth can begin once growing conditions are favorable. The minimal necessary duration of chilling length for any particular variety is known as the chilling requirement for that variety. Temperatures effective in satisfying the chilling requirement normally range from 0°C to 10°C , with the optimal temperature being approximately 5°C. Southern Ontario typically receives well in excess of the 1,750 chilling hours required for several of the fruit species grown here. However, species and even cultivars within a species vary significantly in their chilling requirement. Apples typically require from 800 to 1700 chilling hours to overcome rest.

Growers may be wondering how many chilling hours have been acquired this past winter in the temperate fruit production regions of Ontario. The "Utah" model, the most conservative of the three, indicates that we have acquired 1106-1427 chilling hours up until January 31st. Regardless of what model is selected, it is almost certain that sufficient chilling hours will be obtained by the conclusion of spring in spite of the unusually warm winter.

Research on pears in Europe, indicates that warm temperatures during October can increase fruit yields the following year. However, if temperatures remain warm into November, then yields begin to decline. Early dormant season temperatures (October and November) can play an important role in determining the pear blossom date in the spring. These changes to the flowering date are caused by thermal control of bud development. Warm temperatures in the autumn may result in slower flower bud development and prolonged flowering the subsequent year. This autumn-induced delay in bloom may reduce the risk of spring frost to pear flowers.

Figure 2. Total Ontario apple production (bins/acre) from 1995-2010. (Source OMAFRA)



The effect of warm autumn temperatures on slowing bud development has not been observed in apples, or indeed in later ripening pear varieties. However, apples, which generally flower later than pears, may see reduced benefits from warmer temperatures in October, simply because they have a reduced potential for being exposed to spring frosts. Nevertheless, we hypothesize that relatively warmer temperatures during the dormant and 'rest' period, which would almost certainly cause greater respiration and consumption of carbohydrate reserves in

the tree roots and structural wood, may result in a 'energy' crisis at flowering. The consequence of this would be reduced fruit set and possibly reduced fruit cell division and growth.

So, based on this information what can growers expect for this coming season? Apple growers will have to wait a few months to see what the weather brings during bloom. However, the three-month outlook provided by Environment Canada as of February 1, 2012 indicates continued above normal temperatures. Looking back at the yields following the warm winter of 2001-02 (Fig. 2), they were the lowest since 1995. While other factors such as the widespread spring frost and drought experienced that year had a large effect on overall production and clearly confound any winter weather effects, it is difficult to discount the negative effect a winter might have on production. In some regards, let's hope Wiarton Willie is wrong!

Establishing Drip Irrigation in High Density Orchards: Part 1

Rebecca Shortt, OMAFRA Irrigation Engineer, Simcoe

Irrigation improves tree establishment, nutrient use, bearing area and tree health. It also improves fruit size and quality.

Drip irrigation is based on the concept of preventing rather relieving moisture stress. The crop response to this approach is positive. Some advantages of drip irrigation include:

- easily automated,
- water can be applied on windy days or during spraying operations,
- foliage is not wetted – reduces disease problems and does not remove crop protection materials from leaf canopy or maturing fruit,
- water does not come into contact with the produce and therefore the food safety risk associated with lower quality water is reduced,
- well suited for fertigation (uniform water distribution).

How it works

A drip irrigation system supplies a small amount of water (0.5 – 2 US gal/hr [2-8 L/hr]) near the base of each tree. The system components can be downsized because water is delivered on a more continuous basis (usually on a daily basis when needed) and only the rooting areas are watered (not between the rows). As compared to an overhead irrigation system, the pumps are smaller, less power is required, less energy is used and the water conveyance lines are smaller.

In a high density orchard one to two lines of drip hose will supply each row of trees. The emitters (equivalent to sprinklers in other systems) may be evenly spaced along the lines or clustered near each tree.

Drip systems require filtration units to provide clean water and avoid emitter plugging. Systems also require pressure regulators at the head of each sub-main or other appropriate locations.

Design

A high level of design is imperative for this system to operate properly, especially on rolling terrain. Seek a professional drip irrigation designer.

Choose high quality drip hose (not thin-walled tape) with a minimum expected performance of 15 years. Choose a product where the manufacturer's coefficient of variation (Cv) for the emitter type is less than 0.07. A Cv of less than 0.03 is excellent. Choose an emitter with a low x exponent of 0 to 0.5 (x=0 is a fully pressure compensating emitter). The cost of pressure compensating emitters (lowest x exponent) is higher than non-pressure compensating. A system using emitters with higher x exponent (such as 0.5) may be satisfactorily offset by a skilled system designer.

Filters

There are three main types of filters: screen, disk and sand. The choice of filter type should be made in consultation with the irrigation designer and is based on the irrigation water quality and the emitter orifice size. Filters must be back-flushed to keep them clean and operating properly – this is preferably automated and based on both a schedule and a pressure differential trigger. Filters are classed by the size of the openings of their mesh, which is called "mesh equivalent". A minimum of 80 mesh screen must be used for any drip irrigation system.

Figure 1: Disk Filter Inside

Figure 2. Filter Screen

Watch for Part 2 in the next issue for information on maintenance of the system, as well as scheduling.

Resources

Irrigation Management, Best Management Practices (2004). AAFC-OMAFRA
www.omafra.gov.on.ca/english/engineer/irrigation.htm

B.C. Trickle Irrigation Manual (1999). B.C. Ministry of Agriculture and Food and Irrigation Industry Association of B.C. www.irrigationbc.com

Crop Protection

Update on Apple Scab Resistance Survey

Kristy Grigg-McGuffin, Pome Fruit IPM, OMAFRA, Simcoe; Margaret Appleby, IPM Systems, OMAFRA, Brighton; Leslie Huffman, Apple Production, OMAFRA, Harrow; Kathryn Carter, OMAFRA, Vineland

A 2-year National Apple Scab Resistance Testing Project was launched this past spring, and funded through AAFC's Pest Management Centre. As part of this resistance survey with all apple-producing provinces participating (Nova Scotia, New Brunswick, Quebec, Ontario and British Columbia), Ontario sites were randomly selected by the Ontario Apple Growers from the five growing districts (Figure 1).

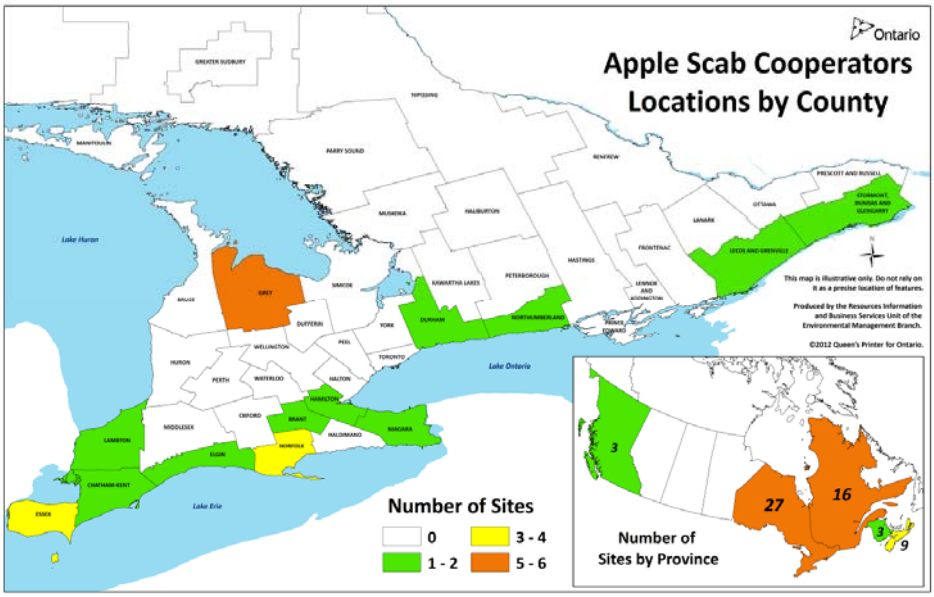


Figure 1. Ontario apple scab co-operator locations by county. Numbers represent the total apple scab collection sites in each province (inset).

Cooperating growers across Canada left 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; a modified SMOR method developed at Cornell University, as well as the DNA screening developed at Michigan State University.

In the modified SMOR method, isolates were plated on fungicide media (Figure 2) and treated with either a SI (Nova or Inspire) or a strobilurin (Flint). Relative growth of each isolate was determined by comparing the growth of the isolate treated with a fungicide to an untreated control (Figure 3 & 4).

Figure 2. Inoculating plates with scab isolates.

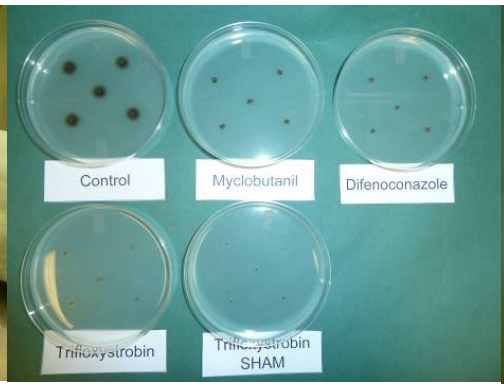


Figure 3. Scab isolates sensitive to fungicide.

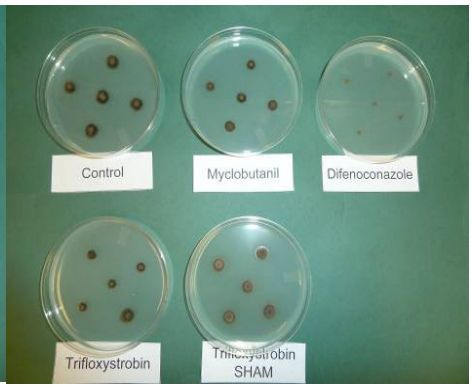
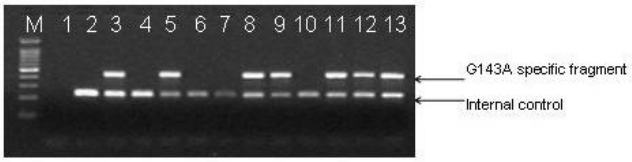


Figure 4. Scab isolates resistant to fungicide.

DNA screening was used as additional testing 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 mutation (Figure 5).



Venturia G143A mutation PCR results

M: 100 bp DNA Ladder marker
Lane 1: no-template control– PCR grade water
Lane 2: Negative control – non-mutant *V. inaequalis*.
Lane 3: Positive control – G143A mutant *V. inaequalis*
Lane 5, 8-9, 11-13: samples positive for G143A mutation
Lane 4, 6-7, 10: samples negative for G143A mutation

Figure 5. Sample of PCR results for presence/absence of G143A mutation associated with strobilurin resistance from 10 isolates in an orchard.

Based on the spring 2011 results (see Figure 6, next page):

- **Use caution when using Nova, Inspire and Flint**; results indicate scab populations in Ontario may be shifting or resistant in some orchards.
- **Scab resistance to Nova** seems to be widespread, but it may still be useful for powdery mildew control.
- Although Inspire is new to the Ontario market, a shift to resistance is already beginning. **Use Inspire carefully!**
- Never use an SI or strobilurin alone, as they can quickly shift to resistant. **Tank mix with a protectant fungicide.**

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.

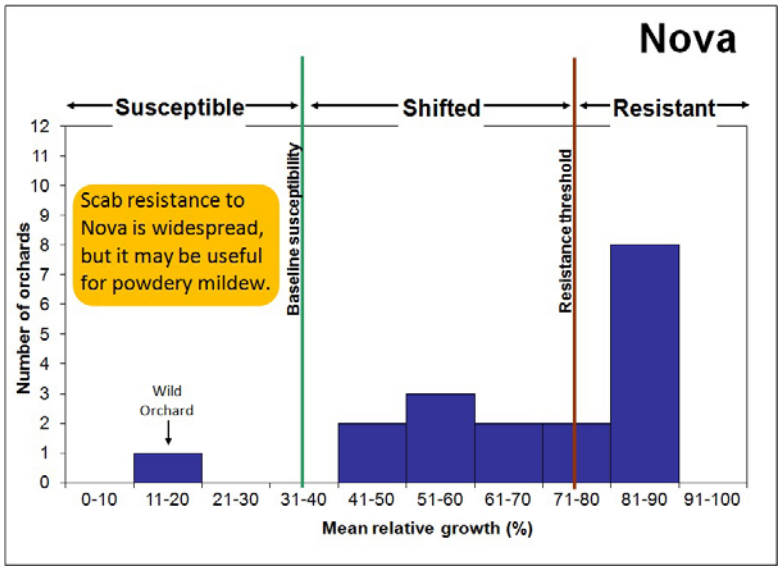
Important notes to remember:

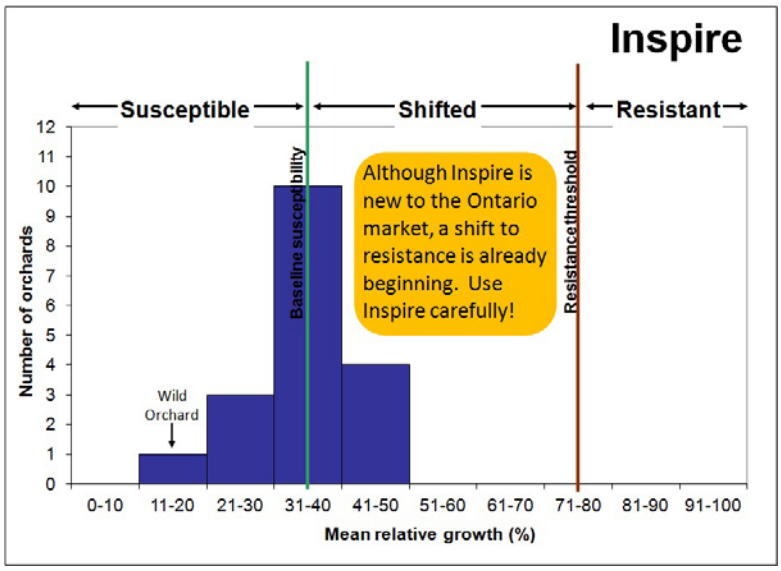
- **SI and strobilurin fungicides should only be used as preventative treatment**.
- **Resistance is dependent on how the fungicide was used.** Though some orchards in your area may show resistance to a product, don't assume it's in your orchard! Each orchard needs to be individually tested for resistance and each product needs to be evaluated.
- 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 used as a **very useful tool to make appropriate apple scab control strategy decisions**.
- **Sanitation works!** Apply urea and shred leaves in late fall or early spring to reduce over-wintering scab spores.

In the spring of 2012, we plan to sample an additional 40 orchards for apple scab fungicide resistance. As well, the second part of this national project which will investigate the resistance to Group 3 & 11 fungicides to powdery mildew will be starting in 2012. This 2-year project was approved in September 2011, and is funded through Canadian Agricultural Adaptation Program (CAAP). Samples of powdery mildew tips will be collected from 50 orchards sites from all apple producing provinces, and tested at the Okanagan Tree Fruit Lab in British Columbia. Both bioassay method and DNA testing will be used to evaluate the samples.

This is a large and challenging project sponsored 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.

The authors gratefully acknowledge Melody Melzer, Shannon Xuechan Shan, Todd Marrow and Gabe Ho at the Pest Diagnostic Laboratory. Technical assistance was provided by Ken Wilson, Lindsay Pink, Brian Sutton, Frankie Cooper, Michelle Linington, Rebecca Vandertoom and Andrea Ricci.





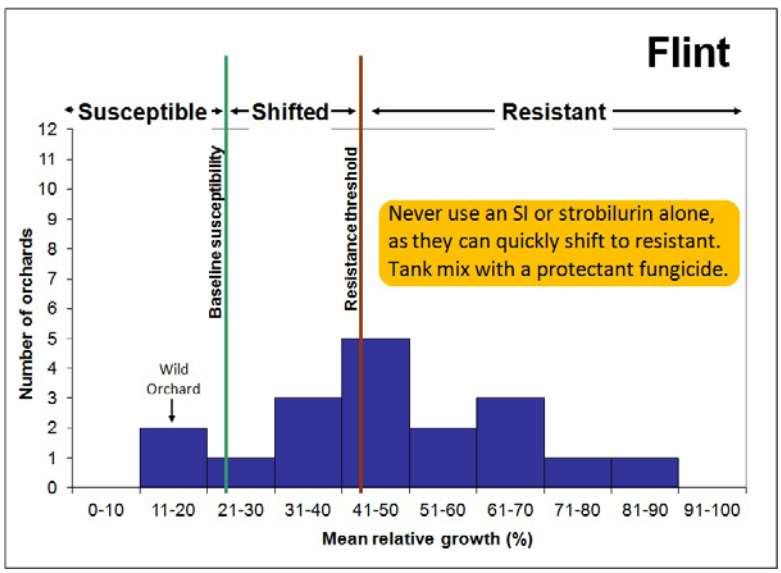


Figure 6. Fungicide sensitivity for apple scab populations from 18 Ontario orchards surveyed in 2011.

Table 1. Presence of the G143A mutation associated with strobilurin (Flint, Sovran, Pristine) resistance from Ontario orchards surveyed in 2009 and 2011.

County	Orchard	G143A mutation	
		# Isolates Tested	Resistant Isolates
2011			
Essex	11-Wild1	10	10%
	11-1	10	90%
	11-2	10	60%
Kent	11-3	10	20%
Lambton	11-4	10	90%
Norfolk	11-5	10	0%
	11-6	10	0%
Brant	11-7	10	70%
Niagara	11-8	10	10%
	11-9	10	0%
Grey	11-10	10	0%
	11-11	10	0%
	11-12	10	0%
	11-13	10	0%
Durham	11-14	10	0%
Northumberland	11-Wild2	10	0%
Leeds & Grenville	11-15	10	0%
Stormont, Dundas & Glengarry	11-16	10	40%
2009 (Ontario orchards, George Sundin, MSU)			
Lambton	09-1	25	48%
Elgin	09-2	24	100%
Norfolk	09-3	20	100%
	09-4	25	40%
Hamilton	09-5	9	89%
Grey	09-6	25	100%
	09-7	24	100%
Durham	09-8	24	4%
Northumberland	09-9	14	0%

What's New in Apple IPM

Kristy Grigg-McGuffin, Pome Fruit IPM Specialist

Despite what the weather might seem, spring is still more than a month away. If you're looking for some reading to help pass the time, here are a few tidbits of interesting new research and development in apple IPM. Pest management in apples is a continually changing and evolving practice as new technologies become registered or implemented. The following are only just a few examples of what the future may hold for IPM practices.

Plum Curculio

Currently, growers in Ontario and the north-eastern US are faced with the problem of accurately monitoring plum curculio (PC). Consequently, populations are often managed through early season calendar- or degree day (DD)-based insecticide programs. A shortcoming with the DD model is that it indicates the last spray against PC should have sufficient residual activity for effective control until 171 DD [base 10°C] have accumulated since petal fall. In other words, this model assumes sufficient insecticide protection to fruit for ~14 days after spray! What with Ontario's wet springs, this interval is often not realistic.

Researchers in the north-eastern US have developed a trap-tree monitoring system to provide early warning of PC presence, abundance and activity level in an attempt to accurately determine timing of insecticide treatments.[1] An orchard-wide petal fall spray is applied first to kill any resident PC or those that may have immigrated into the orchard from over-wintering sites. Subsequent sprays (if needed) are applied to the perimeter only, depending on egg-laying scars to fruit sampled from single trap-trees, baited with an attractive odour. Injury in the most interior rows in trap-tree orchards have been found to be comparable to that recorded in conventionally managed orchards, while significantly reducing the amount of insecticide used. However, this technique is still being developed as a more powerful lure is needed. Though studies in Quebec have documented the tendency of PC to stay on perimeter-row trees, no trials have been done in Ontario with the trap-tree model.

Dogwood Borer

Currently, pheromone lures used to monitor dogwood borer (DWB) will often attract other species of borers, and proper identification is critical for timing insecticides to control this pest. A new pheromone specific for DWB should be commercially available in the near future, and will provide consultants and growers with a better method of monitoring populations in commercial apple orchards.

Studies have tested this DWB pheromone in mating disruption (Isomate-DWB).[3] Preliminary results are suggesting the compound has significant antagonistic effects, inhibiting male response and movement toward a female and overall reducing trap catches. Isomate-DWB is currently not registered for use in Canada. Researchers at Cornell have also recently showed that lesser peach tree borer pheromone mating disruption (Isomate-LPTB) acts effectively as a repellent for DWB.[4]

Ontario Insecticide Resistance Testing

In addition to the national apple scab and powdery mildew fungicide resistance project, several insecticide resistance surveys are currently underway in Ontario.

Preliminary insecticide resistance tests are being conducted on European red mite populations from orchards in Norfolk, Grey and Durham County where control failure has been reported. Results from these tests are still to be determined.

Reduced susceptibility in codling moth populations to Guthion, Calypso and Intrepid was detected in some orchards in Norfolk and Essex County in 2008-2010. Those same populations were also tested with Altacor and still remain highly susceptible to this product. Resistance tests will likely be continued with Imidan, Assail, Rimon and Delegate. A codling moth population from Grey County was also collected in 2011.

Apple Scab Sanitation

Since apple scab resistance to sterol inhibitor and strobilurin fungicides has been confirmed in some Ontario orchards, cultural practices need to be implemented to help reduce disease pressure and risk of resistance development. It is possible to reduce the amount of over-wintering apple scab in your orchard using two practical and inexpensive methods: 1) applying urea fertilizer at leaf-fall or in spring, and 2) shredding fallen leaves with a flail mower.

Urea fertilizer at 45 kg/ha (mixed in 1,000 L of water/ha) may be applied at leaf-fall in the autumn or in the spring before bud break. This stimulates leaf breakdown by microbes and promotes faster removal by earthworms that feed on them. Urea also directly suppresses ascospore formation. Treat the entire orchard, including the ground cover in the middle of rows. Apply urea spray using either an air blast sprayer with the upper nozzles turned off, or a boom sprayer set up to spray both under the trees and the middle of row.

Shredding over-wintering leaves in the fall or spring with a flail mower stimulates decomposition and disorientates leaf pieces so they eject ascospores toward the soil, instead of up into the tree canopy. Keep the flail mower set low enough to contact the fallen leaves, and rake or blow leaves from under trees into the middle of the row, or offset the mower to reach them. Chop winter prunings at the same time. The low mower settings required to effectively shred leaves may denude the row middles, becoming muddy and slippery when early fungicide sprays are required. Apply lime at 5.6 tonnes/ha in early winter after leaves have fallen from trees to raise the pH of the fallen leaves and increase rate of microbial break-down.

Since the early 2000's, research has shown this practice to be effective in reducing over-wintering spores. Research from the University of New Hampshire showed a 97% reduction in ascospore productivity in leaves sprayed with 5% urea just before leaf-fall, 50% reduction when urea was applied to the leaf litter when approximately 95% of the leaves had fallen, and 70% reduction when urea was applied to the leaf litter in spring.[5] As well, the same researchers also reported that shredding the leaf litter in November or April will reduce the risk of scab by 80-90%. Similar findings have also been reported from Quebec.[6]

An orchard that had a severe scab problem last year will benefit from reduced diseased pressure, making effective control with fungicides during primary scab season more likely. Again, lowering the disease pressure will reduce the risk of developing resistance to fungicides, such as sterol inhibitors (Nova, Nustar, Inspire) and strobilurins (Flint, Sovran, Pristine).

Brown Marmorated Stink Bug

The threat of the brown marmorated stink bug (BMSB) continues to be a concern for Ontario growers. Early last year, we reported on a homeowner find of BMSB in an urban centre in Ontario. In the fall of 2011, there were four additional homeowner interceptions, including two in early December. Three homeowner finds were confirmed so far in 2012. We have also learned of two confirmed finds in late 2010. All of the finds –a total of ten adult specimens –have occurred in Hamilton, ON. While we have yet to find BMSB in the field, the presence of several specimens in a small geographic area and over multiple years implies that a population of this pest may have already become established in Ontario. For information and updates, visit our BMSB website at www.ontario.ca/stinkbug

References

[1] Pinero J.C. et al. (2011). Effectiveness of Odor-Baited Trap Trees for Plum Curculio (Coleoptera: Curculionidae) Monitoring in Commercial Apple Orchards in the Northeast. Journal of Economic Entomology 104: 1613-1621.

[2] Zhang A. et al. (2005). Sex pheromone of the dogwood borer, *Synanthedon scitula*. Journal of Chemical Ecology 31: 2463-2478.

[3] Kain D. & Agnello A. (2010). Controlling dogwood borer using an antagonistic sex pheromone blend to disrupt mating. New York Fruit Quarterly 18: 23-24.

[4] Sutton D.K. et al. (2000). Effects of shredding or treating apple leaf litter with urea on ascospore dose of *Venturia inaequalis* and disease buildup. Plant Disease 84: 1319-1326.

[5] Vincent C. et al. (2004). Apple leaf shredding as a non-chemical tool to manage apple scab and spotted tentiform leafminer. Agriculture, Ecosystems and Environment 104: 595-604.

It's 2012 – Do You Know Where Your Sprayer Is?

Dr Jason S.T. Deveau, Application Technology, OMAFRA, Simcoe

Wiarton Willie and Shubenacadie Sam predicted early spring; Punxsutawney Phil said more winter, but I don't think he's seen all the green grass in Simcoe. Whether you believe in the meteorological prophecies of groundhogs or not, it's time to start thinking about your sprayers.

Ontario growers have three upcoming training opportunities about sprayers:

1. Ontario Fruit and Vegetable Convention, Feb. 23, Room 203

A presentation and round-table discussion about the 2011 Advanced Sprayer Workshops. Three co-operators who opened up their spray programs and made some big changes will talk about what worked and what didn't.

2. Airblast 101 Workshop Series 2012

An interactive classroom workshop with hands-on demonstrations and dialogue about airblast sprayer calibration, maintenance and adjustments to match the crop. This is the second year for this series. Workshops are from 8 am to noon.

- Bring your sprayer pressure gauge(s) for accuracy testing
- Certified Crop Advisor credits offered
- Full colour 120 page resource workbook provided
- Lunch provided following workshop
- $20 workshop fee paid at door

Workshop Dates:

- February 27, 2012 – Brighton
- February 28, 2012 – Simcoe (now full)
- February 29, 2012 – Vineland (now full)
- March 1, 2012 – Harrow

To register:
Call Nancy (CropLife Canada) at 416-622-9771

3. The 2012 Advanced Sprayer Workshop Series for Apple Growers

Thanks to the Ontario Apple Growers and the Farm Innovation Program, we are expanding this series to 3 new locations, likely in Vanessa, Niagara and Brighton. Workshops will be held in April and July.

We calibrate and adjust the sprayer in an on-farm workshop, calculating the optimal sprayer output for early season spraying. In July, we adjust to reflect a growing, filling canopy. Water-sensitive paper is used to confirm the results.

This year we have a new twist. Kim Blagborne, the owner of Slimline Manufacturing, makers of the Turbomist sprayer will provide a demonstration sprayer for our workshops. His engineers have cut away parts of the sprayer to reveal the inner workings and show how the sprayer works.

Plus, we'll be exploring a relatively new concept called "Gear Up, Throttle Down". Tests in the U.S. for the last 10 years have shown that reducing fan speed and slowing the PTO in the early season improves coverage, and reduces fuel cost by 25%. The operator can maintain travel speed, and no re-calibrations are needed!

I'm going to be learning along side everyone else, so even if you attended last year, consider coming out again. The OAG will send updates of dates and locations. So, lots of opportunity for new learning and refreshing some core concepts. I hope to see you at all three events!

New Spray Drift Videos

Dr. Jason S.T. Deveau, Application Technology; Kristen Callow, Weed Management, Horticulture

Pesticide spray drift has become a prominent issue in recent years, impacting sensitive crops, human habitats or environmentally sensitive areas.

CropLife Canada and the Ontario Ministry of Agriculture, Food and Rural Affairs have partnered to develop two educational videos on pesticide application best management practices in an effort to educate, and ultimately reduce the incidents of spray drift.

The first video, **'What is Spray Drift?'**, highlights the various causes of spray drift. The second video, **'Equipment and Methods to Reduce Spray Drift'**, focuses on how applicators can modify equipment to reduce spray drift.

The videos describe the newest and best practices in pesticide application using an energetic and fast-paced. Watch drift happening during night spraying under high powered lights, see air induction nozzles prevent drift on a boom sprayer and learn about how spray particles.

The videos were launched in January 2012 and are posted at www.ontario.ca/spraydrift

Left: Demonstrating how fine droplets drift using food-grade red dye. **Right**: Setting up for night-filming to show how air induction nozzles on airblast sprayers can keep more product on target.

Postharvest

Short-Term Storage of 'Paula Red' Apples with SmartFresh℠

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

The objective of this study was to investigate the effects of SmartFresh on 'Paula Red' apples during short-term air storage. 'Paula Red' apples were harvested on August 24th and 31st, 2011 from a commercial orchard located in Simcoe (Norfolk County), Ont. Fruit maturity for Harvest 1 was <0.1 ppm internal ethylene, 15.3 lb firmness, 10% soluble solids, 3.9 starch index, and 40% water core; and Harvest 2 was 1.7 ppm internal ethylene, 13.6 lb firmness, 11% soluble solids, and 5.4 starch index. Apples were transported immediately following harvest to the nearby storage research facility and cooled overnight at 3°C. Half of the boxes were then treated with SmartFresh (1 ppm, 1-MCP) at 3°C. All apples were subsequently held in air storage at 1°C for 1, 2, or 3 months of storage, and evaluated for quality after 1 and 7 days at 22°C. .

Results

SmartFresh substantially improved firmness retention (3-6 lb firmer) and reduced ethylene production (295 vs. <1 ppm) during 1-3 months of air storage at 1°C.

- There was little effect of SmartFresh on soluble solids, but treated apples from Harvest 1 had higher soluble solids after 3 months of storage (+ 0.8%).
- Malic acid was often higher in SmartFresh-treated fruit after 2 and 3 months of storage (+ 70-180 mg per 100 ml of juice).
- No storage disorders were found after 1 month of air storage at 1°C.
- Core browning developed after 2 months of storage and incidence was higher in SmartFresh-treated fruit from Harvest 1 after 7 days at 22°C (0 vs. 5%).
- High incidence of core browning (Photo 1) occurred in only SmartFresh-treated fruit from both harvests after 3 months of storage plus 7 days at 22°C (37-41%); and there was also some internal browning in these fruit.
- There were few storage rots at each removal time (3-4%) and there was no effect of SmartFresh on rot incidence.

SmartFresh benefited 'Paula Red' apples by improving firmness retention and reducing ethylene production for 1-2 months in air storage at 1°C. However, SmartFresh negatively impacted 'Paula Red' after 2-3 months of storage by substantially increasing the incidence of core browning.

Photo 1: Core browning in 'Paula Red' apples after 3 months of air storage at 1ºC, plus 7 days at 22ºC.

Delayed CA Storage Reduces Disorders in 'Empire' Apples

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

The objective of this study was to investigate the effect of delayed controlled atmosphere (CA) on the development of storage disorders in 'Empire' apples, in combination with postharvest 1-methylcyclopropene (1-MCP, SmartFresh) treatment to maintain fruit firmness during long-term storage. 'Empire' apples were harvested near the beginning of the commercial harvest period in both 2009 and 2010. Internal ethylene concentration was relatively low (<2 ppm), the starch index was less than 5, and fruit firmness ~16.3 lb. Fruit were cooled overnight and then treated with or without SmartFresh (1 ppm 1-MCP, an ethylene inhibitor) for 24 hours at 3°C. Apples were subsequently held either in CA storage (2.5% O_2 + 2% CO_2) at 3°C for 9 months or in ambient air at 1°C for 1 or 2 months and then CA storage at 3°C for 8 or 7 months (delayed CA), respectively.

SmartFresh-treated apples with a 2-month delay in CA establishment had less external CO_2 injury and flesh browning during both years of study (Table 1). Delayed CA for 1 month could also reduce the incidence of these disorders. However, there was not always a significant effect of delayed CA on core browning. These results suggest that there are different mechanisms associated with the development of these storage disorders, especially in relation to ethylene. It is important to note that no apples in this study were treated with diphenylamine (DPA), which can control CO_2 injury.

SmartFresh improved firmness retention of 'Empire' during long-term CA storage, even when CA establishment was delayed (Table 1). For example, apples treated with SmartFresh had similar firmness with a 2 - month CA delay as those with no delay, after 9 months of storage and 7 days of shelf-life at 24°C in the first year of study. There was little effect of delayed CA on internal ethylene, soluble solids, or titratable acidity (data not presented).
Overall, the results suggest that delaying CA storage to reduce the development of certain storage disorders in 'Empire' apples could be utilized in combination with SmartFresh treatment to retard fruit softening during long-term storage. This may be an acceptable compromise for reducing fruit losses due to storage disorders while maintaining acceptable firmness for the marketplace. However, ***further research is needed to determine the effects of fruit maturity at harvest time and shorter delays in CA establishment***, as well as to assess fruit quality after various CA storage durations.

Table 1: Storage disorders and firmness of 'Empire' apples held either in CA storage (2.5% O_2 + 2% CO_2) at 3°C for 9 months (No Delay) or in ambient air at 1°C for 1 or 2 months and then CA storage at 3°C for 8 or 7 months (1 or 2 mo. CA Delay, respectively), plus 7 days at 24°C.

	External CO_2 injury (%)	Flesh browning (%)	Core browning (%)	Firmness (lb)
2009				
No SmartFresh				
No CA Delay	5	69	92	9.6
2 mo. CA Delay	4	40	53	7.5
+ SmartFresh				
No CA Delay	30	64	74	11.4
2 mo. CA Delay	0	26	58	11.6
2010				
No SmartFresh				
No CA Delay	25	31	38	8.8
1 mo. CA Delay	0	10	32	7.3
2 mo. CA Delay	1	9	27	7.4
+ SmartFresh				
No CA Delay	25	12	4	12.5
1 mo. CA Delay	0	7	5	11.7
2 mo. CA Delay	0	3	7	11.3

Announcements

How Do You Get Your Information? Please Complete our Survey

Janice LeBoeuf, OMAFRA, Ridgetown

A team of OMAFRA field staff want to know about usage of various smartphone and mobile device platforms and communication tools, including social media, in the Ontario agriculture industry. An online survey has just been launched, and we would appreciate hearing from everyone working in agriculture, including students. The online survey is being conducted by Ipsos Reid, and is at: www.ipsosresearch.com/OMAFRA. It should take less than ten minutes to complete.

The existing ways of sharing information aren't being thrown out just because we have some new tools, but with so many options out there, it's a good time to ask people how they want to get their information. Results will be available by April, and will help with decisions on where to focus efforts in the fast-changing landscape of mobile tools and online communication.

This project is funded by Agri-Food and Rural Link, the Knowledge Translation and Transfer program under the OMAFRA-U of G Partnership.

Ontario Fruit and Vegetable Convention Reminders

Next week is the Ontario Fruit and Vegetable Convention on Feb. 22 and 23. We are excited about our new location in Niagara Falls at the Scotiabank Convention Centre, which provides more room for the expanded speaker program, and trade show. It's our 10th anniversary of our combined conventions, come celebrate!

The full program is online at www.ofvc.ca. There are 9 concurrent sessions in progress both mornings and afternoon. You can print the full program from the website to plan where to attend.

The Apple Session is on Thursday, with a full day covering topics about producing high quality apples, storing new cultivars, adjusting sprayers for optimum performance, managing insecticides in rainy conditions, and new research on Ontario consumer preferences for apples.

Our international speaker, Raoul Crasborn will be sharing how they produce and export apples at KiwiCrunch, and about the evolution in the New Zealand apple industry for export success.

Apple cider is the topic of the day on Wednesday. Our morning workshop will include research from Cornell in producing quality cider. Speakers will talk about the Ontario beverage industry and the New York cider industry. The winner of last year's Cider Competition, Thomas Wilson and Nicole Judge, will share how they produce winning ciders. The 2nd annual Cider Competition judging will be on Wednesday afternoon, and the winning ciders will be available for tasting on Thursday morning.

Don't forget to visit the Poster session. We are expecting a record number of posters to read about research results in many areas. A special feature is the student competition, be sure to look for their submissions.

Registration is still available at the door, although online registration is now closed. The Farmer & Friends Reception is open to everyone, although those who pre-registered will receive 4 complimentary drink tickets.

Come out to Niagara Falls to learn, share and be in the excitement of Ontario horticulture!

New OMAFRA Publications

- **Publication 360, Fruit Production Recommendations**, is ready to print and will be available by the March. Cost will remain $20.00 plus HST
- **Publication 75, Guide to Weed Control** is now available. The cost is still $15 plus HST, and contains a full revision of recommendations for all crops. New this year is the PCP numbers added to table on herbicides used in Ontario for quick reference
- **Publication 838, Vegetable Crop Protection Guide**, is a new publication for vegetable growers, replacing Publication 363. It will be available at the Ontario Fruit and Vegetable Convention. This guide contains crop protection recommendations, and another new publication with production recommendations for vegetables will be available next year. Cost is $15 plus HST.

How to order OMAFRA publications

- Visit your regional OMAFRA Resource Centre
- Visit ServiceOntario Publications website at www.ServiceOntario.ca/publications
- Contact ServiceOntario Publications Contact Centre at: 1-800-668-9938 416-326-5300 TTY 1-800-268-7095

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

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