



ORCHARD NETWORK

For Commercial Apple Producers

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Orchard Management

Evaluating Buds for Cold Damage

Amanda Green, Tree Fruit Specialist

In the first week of April, we experienced very cold temperatures across the province. Temperatures dropped down to -8 to -16, depending on the region. Due to the warm temperatures experienced in March, many buds were at silver tip to green tip. At these stages of bud development, temperatures were cold enough to cause damage. To evaluate bud survival, there are a couple options; either you can force cut branches to bloom inside or cut open the buds.

To achieve a good estimation of bud survival, collect enough branches to bring in 100 buds. Collect these buds from five representative trees from different areas of the orchard and from different heights in the canopy. Label the branches with tags or flagging tape by variety and location of where you collected the branches.

You can force buds to bloom by cutting off branches, taking them inside and placing them in a bucket of water (Figure 1). Like cut flowers, cut an inch off the end of the branch right before placing them in the water to increase the survival and longevity of these branches inside. Branches will take approximately five days to go from green tip to tight cluster and another five days to reach full bloom.

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The second option is that you can cut open the buds when they reach tight cluster. You can wait for them to reach this stage in the orchard or cut branches from trees, take them inside and force them to progress to this stage. Cut open the buds with a sharp blade by making sequential horizontal cuts, starting from the tip of the bud progressing down to the base of the bud (Figure 2). After each cut examine the pistils for brown and black tissue which is an indication of a dead bud (Figure 3). After being cut for five to ten minutes, bud tissue, healthy or damaged, will start to brown from being exposed to the air. If buds are farther along in development than tight cluster, it may be easier to examine the pistil by making a longitudinal cut (Figure 4).

For a full crop of apples, only 10% of buds that are distributed evenly in the canopy are needed for a full crop of apples.



Figure 1: Branches collected from an orchard and placed in a bucket of water inside a heated building to force buds to bloom.



Figure 3: Buds cut open horizontally. The centre bottom bud has a brown spot indicating damage.

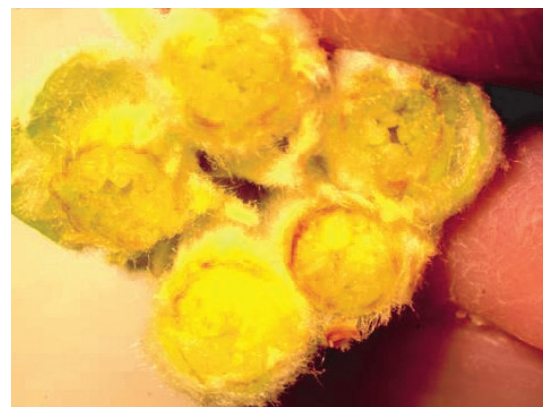


Figure 2: Apple buds cut open horizontally, revealing a healthy bud.



Figure 4: A bud cut open longitudinally revealing a healthy pistil.

Sources:

- Intermountain Tree Fruit Production Guide. "Cold Effects on Fruit: Evaluating Bud & Fruit Damage." <https://intermountainfruit.org/cold-effects/cold-damage>
- Baugher, T. and J. Schupp, 2016. "Assessing Fruit Bud Survival and Crop Potential". Fruit times for PA fruit Growers.

Busting the Foliar Nutrient Myths

Christoph Kessel, *Nutrition (Horticulture)* – Program Lead

Applying foliar nutrients is a common practice in horticulture. How the nutrients are taken up by the leaf and mobilized within the plant is still not well understood.

At the 2016 Ontario Fruit and Vegetable Convention, Dr. Thomas Eichert, from the University of Bonn, Germany, challenged his audience to bust the foliar nutrient myths. Busting these myths can help explain why foliar applications are effective at one time and not as effective at other times.

BUSTED! Myth 1: Foliar fertilization is a natural alternative to soil application

Foliar fertilization is against nature. The leaf surface is a barrier. The nutrients we want to get into the leaf are dissolved in water. But the leaf surface is covered in a waxy cuticle that repels water restricting nutrient movement into the leaf.

Leaves are not like roots that actively and selectively take up nutrients. Rather, nutrients move into the leaf passively and non-selectively. Nutrients dissolved in water and applied to the leaf surface are at a higher concentration than what is within the leaf. This concentration gradient, from the higher to lower concentration, is what drives this passive uptake process.

This passive uptake process depends on:

- the leaf surface permeability, and
- the nutrient concentration gradient between the nutrient applied on the leaf surface and the leaf interior.

BUSTED! Myth 2: The cuticle is the only foliar pathway for nutrients

It is often thought that the cuticle is the only pathway for nutrient uptake and the leaf stomata do not play a role. However, recent studies using nano-sized particles have demonstrated the stomata do provide an opportunity for

nutrients to enter the leaf. The percentage of stomata involved in foliar uptake is generally quite small but the total amount of nutrient taken up through the stomata can be substantial.

Uptake through the stomata is by diffusion along the surface of stomata pores and not by mass flow through the stomata opening.

BUSTED! Myth 3: The cuticular pathway is always available and dominating

The permeability of the leaf cuticle to mineral nutrients is inconsistent. It is greatly affected by relative humidity (RH). Under conditions of low RH, less than 80%, cuticle permeability is low. As RH increases above 80%, permeability increases.

Permeability increases at higher RH because of *aqueous cuticular polar pores*. These pores allow for water molecules to cluster together and be absorbed by the cuticle. The clusters form an aqueous bridge permitting dissolved nutrients to move through the cuticle.

In Figures A and B below, the polar pores are represented by the red upright triangles emerging from the epidermis. Under low RH (Figure A) the polar pores remain within the cuticle. When RH is high, Figure B, the polar pores “emerge” through the cuticle connecting the outer surface of the cuticle to the inner epidermis.

BUSTED! Myth 4: The higher the relative humidity the better.

It would seem that foliar nutrient uptake would be best at higher RH but this does not seem to be the case. High RH both enhances and limits uptake through the leaf.

As described above, a high RH favours nutrient uptake either through the aqueous pores, stomata or for some other reasons not yet clearly understood.

RH can also limit nutrient uptake because RH also controls the evaporation of the applied solution. How quickly or slowly the solution evaporates affects solute concentration which influences the driving force of

Figure A. Low Relative Humidity

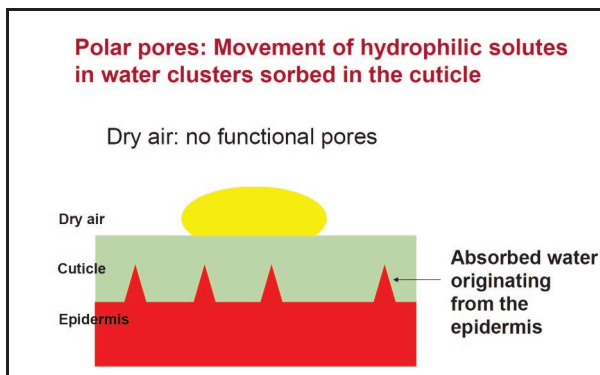
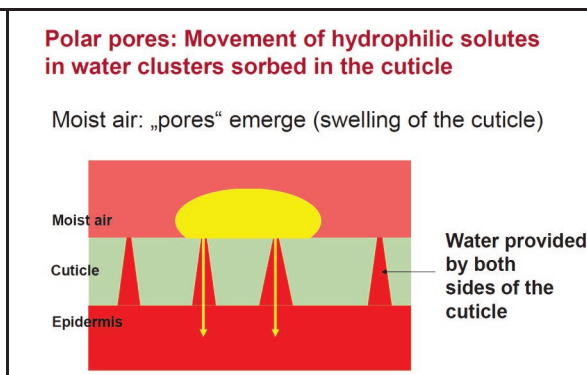


Figure B. High Relative Humidity



Based on: Eichert and Fernandez (2012) in *Marschner Mineral Nutrition of Higher Plants 3rd edition*

penetration and uptake rates. At low RH, the solutions evaporate quickly and uptake is low. If the RH is too high, the nutrients remain in solution longer and more dilute, and uptake is low.

Because of the RH's combined effects on the concentration gradient and the permeability of the leaf surface, maximum penetration rates can be expected at an intermediate RH.

More information on foliar nutrients can be found at the following on-line resources.

- Eichert, T. 2016. [*Foliar uptake: of myths and legends*](#). Presentation at Ontario Fruit and Vegetable Convention.
- Eichert, T. 2016. [*Foliar uptake: bottlenecks to effectiveness*](#). Presentation at Ontario Fruit and Vegetable Convention.
- Fernández, V. and Brown, P.H. 2013. [*From plant surface to plant metabolism: the uncertain fate of foliar-applied nutrients*](#).
- Fernández, V., Sotiropoulos, T. and Brown, P.H. 2013. [*Foliar Fertilization: Scientific Principles and Field Practices*](#)

Crop Protection

Managing Early Season Apple Diseases

Kristy Grigg-McGuffin, Pome Fruit IPM Specialist

Apple Scab

There has been a lot of discussion lately around the risk of apple scab infection during cold weather. Unfortunately, the freezing temperatures do not kill scab spores. Spores will continue to mature and release so long as there is a wetting period long enough for infection to occur, says Dr. Kari Peter (Penn State Fruit Research and Extension Center) and Dr. David Rosenberger (Cornell University Hudson Valley Lab). While mature spores are released more during warm rains than in colder ones, they can still cause infection, nonetheless, if they land on green tissue.

Many regions in the province are beginning to show green tip, which means a protectant spray program should begin to keep growing tissue covered. This is particularly important in orchards with historically high scab pressure. Keep in mind, the level of infection risk for this season is dependent on the overwintering inoculum from last year. If you were chasing scab in your orchard and did not do any sanitation practices (urea spray, leaf mulching) in the fall, the inoculum levels are likely high enough that mature spores could be released with these early wetting events.

Use a few days of warm, dry weather as a good spray window to apply fungicides before the next rain.

As growing degree-days continue to accumulate and temperatures become warmer, the rate of ascospore maturity will increase. This could result in large amounts of spores being released during infection periods and those without adequate fungicide protection could find themselves in a bad situation.

The following are some key points to consider for effective scab control this time of the year:

- When there is the risk for potentially freezing temperatures, EBDC fungicides (Manzate, Penncozeb, Dithane, Polyram) should be used. In his recent blog article [*"Adding Insult to Injury: Scab Warning"*](#), Rosenberger warns that applying captan, Syllit, copper or oil to cold injured leaves could make the injury worse due to uptake of these products into the tissue.
- Like other protectant fungicides, EBDCs are contact fungicides and do not provide effective post-infection or anti-sporulant activity. This means if sprays are applied in less than ideal conditions (ie., windy, alternate rows, or washed off in rain), the risk of scab infection is increased.
- In prolonged wetting events, it is better to re-apply fungicides during a break in the rain to provide temporary protection, than to not spray at all. Apply again once conditions are finally dry to replace residues washed off by rain.
- If there is concern about coverage during a potential infection period, combining an EBDC and a product with good kick-back, such as Scala, Luna Tranquility and Inspire Super may provide post-infection activity up to 48-72 hours in cooler temperatures, depending on the product, from the start of the infection period. Refer to Table 3-13. *Characteristics of Apple Scab Fungicides* in the new [*2016-2017 Publication 360, Guide to Fruit Production*](#) for details on post-infection activity, as well as retention and redistribution properties of registered scab fungicides.

Powdery Mildew

One of the benefits of our cold Canadian winters is sometimes getting a little extra help from Mother Nature with reducing overwintering pressure of diseases such as powdery mildew. Unfortunately, the relatively mild winter we just had may not have been enough to kill overwintering mycelium in buds that were infected with powdery mildew last season. Conidia will grow out of the buds in the spring as infected tissue and spread to other leaves causing secondary infection.

Dormant buds infected with powdery mildew are typically feathered, pointed or shriveled (Figure 1) and usually break dormancy later than healthy buds. This means susceptible, green tissue may already be present when the first conidia are produced. If conditions are ideal, even a small powdery mildew population can quickly explode if not managed properly.



Figure 1. Dormant buds infected with powdery mildew appear feathered, pointed or shriveled and shoots have a thin layer of fuzzy white fungus that is usually fairly easy to see.

Photo: C. Duyvelshoff, Perennia

Protectant fungicides used for early season scab management do not have activity on powdery mildew. Tank-mixing a low rate of sulphur (3-5 kg/ha) with captan and/or an EBDC, beginning at ½" green, will provide good activity on scab while also suppressing powdery mildew. This early season program will help free up other chemistries, such as the sterol inhibitors (Nova, Fullback), SDHIs (Aprovia, Fontelis, Sercadis, Luna Tranquility) and strobilurins (Pristine, Flint, Sovran) for later use when plenty of new growth is present.

Some key points for effective powdery mildew control this year include:

- Maintain a tight spray schedule with high rates during primary scab infection period. Powdery mildew does not invade mature leaf tissue, so spread of mildew ceases when trees stop producing new terminal leaves.
- Rain deters powdery mildew development by washing off spores. Instead, mildew thrives in dry weather and high relative humidity. So, protectant sprays may still be required during dry periods when there is little risk from apple scab.
- Getting good mildew control following an outbreak will take several seasons. Mildew infected white shoots from last year's failure will persist through the season, but does not indicate current fungicides are failing. The current season mildew program is designed to prevent spread that would lead to primary infection for next year.
- Include a mildewcide, such as sulphur in all sprays beginning at ¼ - ½" green until temperatures are greater than 25°C or when applying oil. Sulphur lacks post-infection activity, so must be applied early season. A tank-mix that includes captan, EBDC and sulphur provides excellent protection against scab, rust and mildew.

- Where they are working, include fungicides from other groups, including sterol inhibitors, strobilurins or SDHIs during the critical infection period, generally at pink and petal fall. Tank mix these products with captan or an EBDC.
- If pressure was low last year, oil applied for mites may provide suppression of powdery mildew. Do not use captan- or sulphur-containing products within 14 days of an oil application.

Fire Blight

Fire blight bacteria overwinter at the edges of cankers. In the spring, as temperatures increase above 18°C, cankers become active and droplets containing high numbers of bacteria ooze out of cracked and infected bark tissue (Figure 2). This bacterial ooze can then be spread to new growth through rain splash or insects.

The efficacy of copper sprays this time of year to reduce the spread of fire blight inoculum from overwintering cankers has often been debated. Its effectiveness really comes down to how it is applied and post-application weather. Copper provides an unfriendly environment over the bark and bud surfaces of the tree, preventing bacteria from getting established or spreading. Thus, it must be applied as a high volume spray to ensure sufficient coverage.

As well, in order for copper sprays to work effectively, it is recommended that they be applied to all of the trees in the block. Untreated trees, even non-susceptible varieties, provide a safe haven for the bacteria and insect vectors can move the bacteria around easily.

Fixed copper should not be applied after ½" green since later sprays can result in severe fruit russetting. An exception to this may be the new copper octanoate, Cueva, which has a lower concentration of copper due to its formulation with a fatty acid. This product is registered for season-long use. However, OMAFRA has little experience with this product.



Figure 2. Fire blight canker with bacteria oozing out onto the bark surface.

Copper sprays applied to green tissue may also provide some protection against apple scab when applied before spores are released. However, this should not take the place or delay the application of the first scab protectant fungicides.

Still Time for Dormant Oil

Kristy Grigg-McGuffin, Pome Fruit IPM Specialist

Dormant oil sprays are excellent tools for targeting overwintering scale (Figure 1) and European red mite eggs (Figure 2). If applied properly, oil can sufficiently reduce the amount of insecticides/miticides used for these pests later in the season. Early season oil sprays also fit well into IPM programs because the product is applied before predatory mites and other beneficial insects are present. Finding the time and good weather early in the season, however, can be quite challenging.



Figure 1. Overwintering scale on limb

As we are experiencing this year, temperatures dropping below zero, particularly overnight can continue well into the spring while apple buds are beginning to open. To avoid crop injury, oil cannot be applied within 48 hours of freezing weather. Because of this, some regions in the southwest part of the province may have missed the optimal window for a dormant oil spray to target scale.

However, a delayed-dormant oil spray is still worth considering. While efficacy against scale can be reduced with later oil applications, if European red mite is an issue in your orchard, sprays delayed to half-inch green to tight cluster can be quite effective. Delayed-dormant oils may also kill overwintering aphid eggs, if the timing coincides with hatching.

It is important to also note that oil cannot be applied within 14 days before or after the application of products containing captan or sulphur. As well, horticultural oils may cause bark damage on Red Delicious, Empire and Mutsu/Crispin. Check product labels for additional instructions and precautions.

If scale has been an issue in your orchard and you were unable to apply dormant oil this year, you may want to consider summer management of scale

crawlers. Movento (Group 23), Closer (Group 4C), TwinGuard (Group 4C+5, same active ingredient as Closer) and Sivanto Prime (Group 4D) are all products registered for the control of scale. These would be applied when crawlers are active. Monitoring in some Ontario orchards in recent years indicate this is typically mid- to late June for 1st generation crawlers and early to mid-August for 2nd generation crawlers. Both generations can be active for 4-6 weeks.



Figure 2. Overwintering European red mite eggs on spur

Apples to Be Removed From Vivando Fungicide Label

Kristy Grigg-McGuffin, Pome Fruit IPM Specialist

According to a BASF Canada Product Statement, *during the 2015 growing season, BASF received several reports in the United States that select apple varieties were injured when tank mix applications of Vivando fungicide were applied.*

While injury has not been reported in Canada, as a precaution, BASF Canada “advises that growers **DO NOT** make applications of Vivando fungicide to **apples or other pome fruit crops**”.

Vivando, a Group U8 was only recently registered on apples for the control of powdery mildew, beginning at green tip to half-inch green. Alternative chemistries that are effective against powdery mildew include sulphur, sterol inhibitors (Group 3), succinate dehydrogenase inhibitors (Group 7) and strobilurins (Group 11). Management should begin at green tip, particularly for susceptible varieties or if disease pressure is historically high and continue until terminal bud set.

Despite tank mix issues in pome fruit, Vivando fungicide has been used successfully for control of powdery mildew on grapes for many years and is also labelled for use on apricots, cherries, peaches, fruiting vegetables, cucurbit vegetables and hops.

For more information, please contact your local BASF horticulture specialist.

Fire Blight Prediction Models

Again this year, Michael Celetti, OMAFRA Plant Pathologist, Horticulture Crops Program Lead, will be developing [fire blight risk prediction maps](#) for the province. These will be updated every Monday, Wednesday and Friday from May 1 until the end of bloom and will be posted on the OMAFRA website, as well as distributed through the OAG.

If you are interested in running fire blight prediction models for your own orchard, there are two models that have been developed to help forecast conditions that lead to blossom infection: Maryblyt and Cougar Blight. Daily information on temperature and rainfall, as well as key observations of tree development, including 50% green tip, first bloom and petal fall are important. With many regions reaching green tip or near it, now is the time to familiarize yourself with the models if you're planning to use them.

Click [here](#) for a free download of the Cougar Blight model or visit the Chelan-Douglas County Washington State University Extension website.

Click [here](#) for a free download of the Maryblyt model or visit the West Virginia University's Kearneysville Tree Fruit Research and Education Center website.

Recent PMRA Re-Evaluation Decisions Affecting Apples

Kristy Grigg-McGuffin, Pome Fruit IPM Specialist
Amanda Green, Tree Fruit Specialist

In recent weeks, the Pest Management Regulatory Agency (PMRA) released important re-evaluation decision documents that are pertinent to apples.

Firstly, there are two proposed re-evaluation decisions for **CAPTAN** and **THIRAM**, calling to **end all uses on apples**. These decisions are not final, so input from the industry is extremely important to demonstrate the value of these products.

Captan (Supra Captan 80 WDG, Maestro 80 DF)

- This is due to worker post-application exposure.
- There is a 90-day comment period open until late June if you would like to provide comments directly to PMRA Publications.
- The Ontario Apple Growers (OAG) are submitting a letter on behalf of their members in support of keeping this product.
- A survey (via Survey Monkey) has been distributed to all OAG members to gather more information on use patterns. **Growers are encouraged to please take the time to complete this survey** as this information will be used to strengthen Ontario's stance that this is a valuable product for apple disease management.

Thiram (Granuflo-T, Thiram 75 WP)

- This is due to worker exposure issues, toxicity to non-target organisms, and carcinogen concerns (dietary) for the general public.
- There is a public comment period open until the end of May if you would like to provide comments directly to PMRA Publications.
- The Ontario Apple Growers (OAG) are submitting a letter on behalf of their members in support of keeping this product.

There has also been a final PMRA re-evaluation decision for **CARBARYL** (Sevin XLR).

- This is due to worker post-application exposure which has effects on the nervous system and carcinogenic risks.
- The use of carbaryl **for insect control is to be cancelled**. Leafhoppers will remain on the label until this registration expires in 2018.
- Carbaryl for the use of **thinning** is still on the label with the following conditions:
 - High density, trellised orchards (spindle or super spindle): maximum seasonal rate of **1.5 kg a.i./ha** and an REI of **14 days** for hand thinning.
 - Traditional orchards (dwarf, semi-dwarf and full sized trees): maximum seasonal rate of **1 kg a.i./ha** and an REI of **17 days** for hand thinning.
 - Maximum of **1** application per year
 - Use of chemical-resistant gloves are recommended during hand thinning
 - For hand pruning, scouting, tying, training, the REI is 4 days
- This takes effect when the new label is available by the registrant. The registrant has 12-24 months to make these label amendments. These new restrictions must be followed regardless of whether the grower still has product with the old label.

Alert: Cankers in Apple Orchards

Michael Celetti, Plant Pathologist Horticulture Crops Program Lead

Apple growers may notice more cankers on limbs and trunks of trees in their orchards last year and again this spring. Often cankers show up in orchards one or two years after a severely cold winter. Many canker causing organisms are opportunistic, infecting through wounds caused by machinery, insects, hail or cold injury. Some canker causing pathogens get into wounds and become established without causing noticeable symptoms until the following season or even two seasons after the wounding and infection event occurred. With the cold winters experienced in Ontario during 2014 and again in 2015, it is anticipated that canker causing pathogens that infected through the cold injury wounds will manifest into cankers this coming season.

Black rot (*Botryosphaeria obtusa*) is probably the most common canker found on apple trees in Ontario (Figure 1). Wounds on limbs and trunks caused by winter injury provide an entrance for the black rot fungus to infect and colonize. The pathogen does not infect healthy wood directly. Initially the fungus causes a subtle reddish, sometimes slightly sunken, discolouration under the bark. This discolouration may be a few centimeters in diameter or it can grow up to several meters under the bark (Figure 2). Growers may not recognize the subtle early symptoms of black rot cankers that develop on wounded limbs or trunks during the first season after winter injury. At the end of the season or beginning of the following season, the infected bark dies, cracks and peels away from the sunken area exposing black diseased wood beneath (Figure 1). Some of cankers will remain small but many will continue to grow and over time girdle the limb, branch or trunk. Often it takes 2 years before obvious symptoms of black rot cankers to show up. Many of the larger cankers observed last season (2015) was probably a result of infection of winter injured wood during 2014. It is likely that more black rot cankers will show up this year due to infection through the winter injury caused during 2015.



Figure 1. Mature black rot canker with peeling bark exposing black discoloured wood.

Anthraxnose canker (*Neofabraea malicorticis* and *N. alba*), sometimes called fiddle string canker, and perennial or false anthracnose canker (*N. perennans*) look very similar and are difficult to distinguish one from the other. The pathogen infects wounds under very humid conditions, and in Ontario, is sporadically observed in orchards in close proximity to the lakes. The perennial canker causing fungus requires a wound to infect and is often associated with events that cause injury to the trees such as cold winter injury. Initially the cankers appear as small oval red to purple spots on limbs or trunks of trees. These spots enlarge and eventually become orange to brown sunken spots. As the bark begins to shrink within the enlarging canker, the edges of the oval canker cracks and separates from the healthy wood. The bark eventually sloughs off exposing the wood and 'blast fibers' that the fungus cannot decompose, giving the



Figure 2 Black rot cankers initially appear as subtle reddish, sometimes slightly sunken discoloured areas, under the bark.

canker a 'fiddle string' appearance (Figure 3). Although the fungus can produce spores all season long, spore production tends to peak in the autumn. Fortunately apple trees quickly defend against these types of cankers by producing callus growth around the disease tissue and compartmentalizing the infection and stopping it from advancing or growing larger within the first year of infection (Figure 3).



Figure 3. Anthracnose canker with 'blast fibres' is sometimes called 'fiddle string' canker. Note the callus tissue that developed around the border of the canker to compartmentalize the infection and prevent it from expanding.

Nectria twig blight and canker (*Nectria cinnabarina*) occurs sporadically in orchards across Ontario and seldom causes significant damage (Figure 4). The pathogen often infects through wounds on twigs and

branches caused by injuries including winter injury. The fungus eventually girdles the twig or branch which wilts rapidly resembling symptoms of fire blight (Figure 5). Orange to bright pink spore cushions develop in the canker at the base of the wilted branch and twigs. Spores are produced in the autumn and spring. The canker is usually confined to small weakened twigs and branches and rarely observed on larger scaffold branches or trunks.



Figure 4. Nectria canker with orange spore cushions on a large branch.



Figure 5. Nectria twig blight can resemble fire blight shoot blight.

Many woody plants such as maple, birch, hickory, poplar, beech, and hawthorn are alternative hosts to canker causing pathogens. Orchards planted near wood lots may be more vulnerable to these diseases. Pruning out diseased limbs and dead wood during the dormant

season is an important practice to reduce the inoculum sources within the orchard. Cankers may be surgically removed from trees if feasible and practical. It is a good practice to paint over pruning stubs or exposed wood with tree paint to help prevent re-infection into the wound. In addition, it is important to remove the infected prunings or wood from the orchard since these pathogens can survive and produce spores on living and dead tissue. Burning or chopping the prunings on the orchard floor with a flail mower will also reduce inoculum levels. It is not a good idea to stack wood in piles in or near orchards since it may be colonized by canker causing fungi and can act as a source of inoculum. Mummified fruit left in trees can harbor the black rot pathogen and should be removed promptly.

Preparing Airblast Sprayers for 2016

Jason Deveau, OMAFRA Application Technology Specialist, Simcoe

Airblast sprayers are precision tools that must be kept in good operating order to ensure proper spray quality. The daily sprayer inspections can be considered a form of “preventative” maintenance since the operator will (hopefully) find small problems before they become big problems. The diligent operator should also follow a regular sprayer maintenance schedule throughout the season, according to the sprayer manufacturer’s recommendations. It’s very much like having your car serviced every 6,000 kilometres, except in this case, sprayer maintenance schedules are often associated with the number of working hours. Many sprayer operators are guilty of ignoring their airblast sprayers and babying their tractors; don’t neglect your sprayers!



Figure 1: This used Myers sprayer was imported from Europe by a vineyard in Prince Edward County, Ontario. Many European countries require regular sprayer maintenance inspections before the operator can use them. The stickers on this sprayer show that it was maintained and calibrated correctly. In certain countries, sprayers that are not compliant are “grounded” until the issue is remedied, and the owner is charged a hefty fine. We don’t require this level of compliance in North America... yet.

Pre-season maintenance

If the steps outlined here differ from the manufacturer's recommended practices, go with the manufacturer; your warranty may depend on it.

Never assume that just because you followed the manufacturer's winterizing instructions that your sprayer is ready for immediate hook-up and use in the coming season. Parts seize, scale breaks away from surfaces, and small beasts sometimes choose to eat, or make their homes, in cozy sprayers.

Plan to spend at least half-a-day per sprayer. It may not take that long or it might take longer. Pressure gauges snap off, fittings crack, welds might need repairing and bearings seize. Be sure you have a plan to get replacement parts before you start.

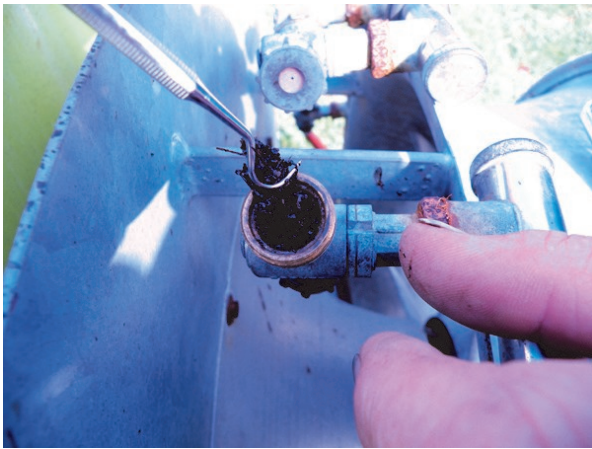


Figure 2: After buying a new-to-me three point hitch GB sprayer, I ran a pre-season maintenance inspection. I was assured it was winterized correctly before it was stored. However, every nozzle body was packed with what looked like wet chewing tobacco. I still have no idea how it got in there, but I'm guessing a lack of appropriate filtration was a big factor.

If this is a brand new sprayer, here are a few tips to consider:

- Get to know your new sprayer. Read the operator's manual and the manufacturer's specifications to understand what the sprayer is supposed to do, and what it's not supposed to do.
- Loosen, lubricate and re-tighten the gear clamps to ensure they last. Always back them off a bit first before tightening them to avoid stretching them.
- Apply light gear oil to the PTO telescope.
- Follow all the hoses and use a paint pen to number the hose ends with the corresponding connection. Now you'll always know where they go.
- Apply thread release (aka 'never seize') to all the bolts. A lubed bolt or stud should never release easily. If it does seize, put the nut or bolt back on, clean the thread to avoid damage and try again.
- Visual checks of secure nuts are made possible using a paint pen.
- Use a torque wrench (not impact tools) when

replacing nuts and remember to read the manufacturer's specifications to ensure they are tightened correctly. Never extend a torque wrench handle with a pipe and don't hold them anywhere but on the knurled handle or they won't be accurate.

- Use a paint pen to draw a line across the nut, washer and chassis. This creates a means for a quick visual check for loose nuts.

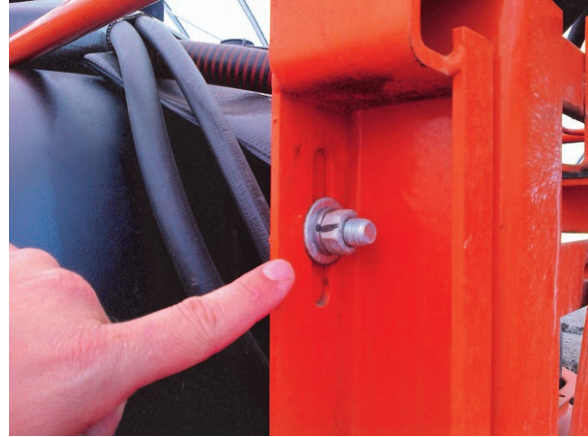


Figure 3: Visual checks of secure nuts are made possible using a paint pen.

If your sprayer has been in long-term storage (e.g. winterized), then following these steps will help prevent costly breakdowns, inconsistent spray application, and may increase the lifespan of the sprayer equipment.

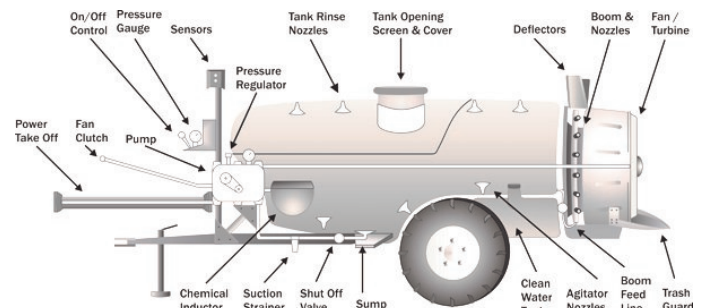


Figure 4: The anatomy of a generic, but fully-loaded, airblast sprayer.

The Pump

One of the most common causes for faulty pump performance is "gumming" or corrosion inside the pump. Get into the habit of flushing the pump (and the entire system) with a solution that will chemically neutralize whatever you sprayed that day. This will dissolve most residues remaining in the pump and leave it clean for each use.

With filters and nozzles removed, fill the tank with clean water and pump it through the system until the discharge is clear of dirt, sludge or scale that might be present in the tank, pump, and hoses or lines. The discharge should be clear – not cloudy.

There's always residual liquid in the lines – wear chemical-proof gloves!

Once the system is flushed, lubricate and check the pump. Maintenance for pumps is pump-specific. The sprayer operator's manual will give detailed instruction on how to care for yours. Sprayer pumps can be divided into two categories: Positive Displacement Pumps and Non-Positive Displacement Pumps.

Positive Displacement Pumps

These include Roller, Diaphragm and Piston pumps. They are self-priming and traditionally operate at “high” pressures. Flow from these pumps is directly proportional to the pump speed, which is why they require a relief valve and bypass line between the pump outlet and the nozzle shut-off valve.

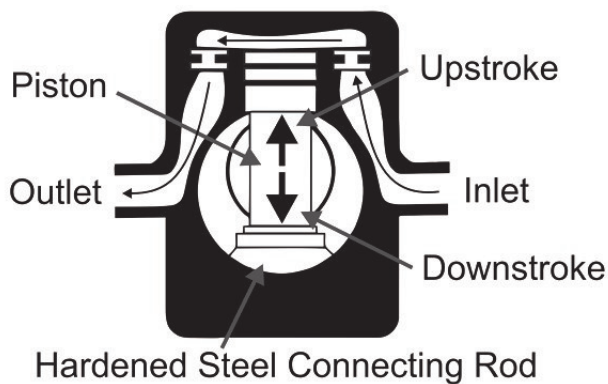


Figure 5: There are three types of sprayer pump commonly found in Ontario airblast sprayers. This is a Piston.

Roller pumps are the most popular pump with farmers world-wide, but I've never personally seen one on an airblast sprayer. The seal and roller materials should be selected based on their compatibilities with the pesticides.

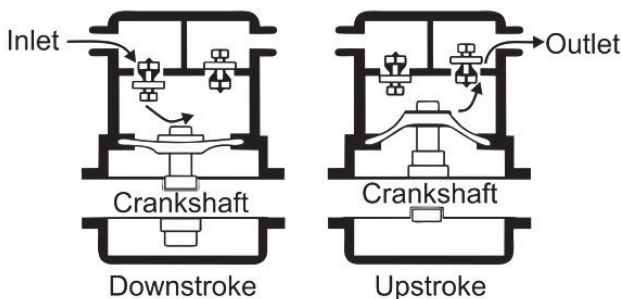


Figure 6: There are three types of sprayer pumps commonly found in Ontario airblast sprayers. This is a Diaphragm.

Diaphragm pumps are compact and popular for use with abrasive and corrosive pesticides. Their oil-filled piston chambers protect the pump materials. These are commonly found on airblast sprayers. HyPro recommends changing oil after 40 hours of break-in operation and every 500 hours after that. The diaphragms

should be replaced every 1,000 hours. Generally speaking, EPDM (black) diaphragms are a better choice for airblast sprayers, while the Desmopan (amber) diaphragms are really for lawn care sprayers.

Piston pumps are similar to car engines. They are relatively low-flow and high-pressure and suited for use with handguns sprayers. The piston cup materials should be selected based on their compatibilities with the pesticides. These are commonly found on airblast sprayers.

Sometimes the pump may be referred to as a “piston-diaphragm” pump, combining features of the two.

Non-Positive Displacement Pumps

These include Turbine (or Transfer) and Centrifugal pumps. They must be primed and traditionally operate at “low to medium” pressures, although there are models available that can go up to 190 psi. Flow from these durable pumps comes from a rotating impeller that feeds liquid through the lines instead of pumping per stroke. Therefore, if the outlet is closed, the impeller spins harmlessly, so a relief valve is not needed.

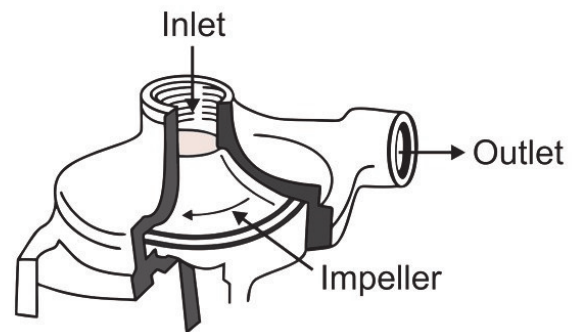


Figure 7: There are three types of sprayer pumps commonly found in Ontario airblast sprayers. This is a Centrifugal.

Centrifugal pumps are found on many airblast sprayers in Ontario, but I don't often encounter them anywhere else. The lack of a pressure regulator valve and the difficulty separating PTO speed from pressure make it more difficult to match the sprayer to the target. Corrosion is the big concern, here. If the sprayer was winterized correctly, it should have been cleaned and flushed with a 50% solution of antifreeze with a rust inhibitor. The ports should have been plugged after to keep air out. Unplug them before running them clear. You can learn about selecting a pump in this article <http://sprayers101.com/pumps/>.

The Hoses

Under-sized hoses, fittings and splices can severely reduce the capacity of any pump. Suction hose diameter should be at least as large as the pump intake opening. Examine all hoses and connections for cracks or leaks while under pressure. Avoid splices where possible.

The Screens & Strainers



Figure 8: Inline filters shouldn't look like this. This was a serious tank-mix incompatibility issue.

Do you clean yours at the end of every spray day?

Photo Credit – M. Lanthier, British Columbia.

If you don't already have three levels of filtration (including the tank-opening basket) then consider slotted (not mesh) strainers behind the nozzles. If you don't use them because they plug up, then look to your agitation system: If there is sludge in the sump at the bottom of the tank when you're done spraying, then you're not mixing and/or agitating your spray solution properly. This will lead to a gummed pump and clogged strainers and nozzles. It may also be your sprayer hygiene: you should be cleaning strainers and nozzles after every spray day. Remove slotted or mesh nozzle strainers and scrub them with a bristled brush because flushing will not clear them.



Figure 9: This plastic 'sight glass' indicates how full the tank is. They become opaque and unreadable in a season or two, but they're very easy to replace.

Can you see through yours?

The Pressure Gauges

The relief valve on your sprayer should always be in the bypass position during start-up. If your gauge spikes then the gauge may always read high afterwards and should be replaced. Likewise, an opaque or leaking gauge should be replaced. Replacing old gauges improves sprayer performance considerably.

Be sure to use the oil-filled variety of gauge to eliminate a bouncing needle. You can also get suppressors that fit between the gauge and sprayer to prevent pulsing. Consult the article on testing airblast pressure gauge reliability.

Gauges should be rated twice as high as your highest operating pressure. For example, if you typically spray at 150 psi, have a gauge rated up to 300 psi. That way, you can see small changes in pressure more clearly. Plus, if your needle is pointing straight up, you know your pressure is approximately correct.

The Wheels

At minimum, check the tire pressure. Hard tires drive faster, but leave compacted ruts. Soft tires drive slower, but disperse weight better. 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 Belts and Power Take-Off (PTO)



Figure 10: Check the belt alignment. If the belt is not exactly true (i.e. in line), it will not operate efficiently and may wear out more quickly.

Check all belts for wear, proper tension and to ensure they are true (i.e. perfectly aligned). This ensures that power is transmitted efficiently.

Grease the PTO splines and tubes (often) and clean the connection zones. When the sprayer is hitched to the tractor, the PTO should be level to prevent vibration and strain on turns. Never operate the sprayer without a shield in place!



Figure 11: Universal joints seize and break more often than you think. Check and grease them regularly.

The Agitator

Many spray materials do not mix well and one of the common causes of uneven application is poor agitation. If you find deposits at the sump in the bottom of the sprayer after an application, your agitation is insufficient. For mechanical agitators, check for propeller wear and ensure paddles are secure on the agitator shaft. Learn more about agitation here.

If the agitator shaft is leaking a little, tighten the packing. The packing gland is a common source of leaks; keep it properly greased. If a leak occurs you can usually repair it by tightening the bolts on the packing gland by $\frac{1}{2}$ a turn, but if that doesn't work you may have to remove and repack (or replace) it.

A leaky mechanical agitator – a little is alright, but a lot means you have to tighten or even repack the gland.



Figure 12: A leaky mechanical agitator – a little is alright, but a lot means you have to tighten or even repack the gland.

The Propeller (Fan)

Check the propeller blades for any nicks or cracks that could imbalance the propeller and produce vibration. They should be scraped clean to remove any accumulated residue. Tighten the bearings, lubricate the moving parts, check for loose bolts and broken brackets and clean the trash guard, if present. Ensure that the fan entrance grill is securely in place and has not been punctured or damaged.

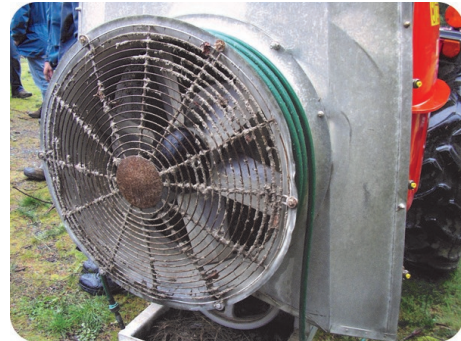


Figure 13: A dirty grill. Make sure to clean sprayer equipment thoroughly, but avoid using a pressure washer which can drive grease out of sealed bearings.

Growers have reported that installing bottom deflectors prevents the fan from stirring up dust and leaves. This has reduced the caking on the fan blades and protects adjacent plants from possible physical damage. Learn about adjusting air direction here (sprayers101.com/adjust-the-direction-of-the-air-stream/).

The Nozzles

Nozzles require far more than can be included in this article. There are lots of articles to read on the topic if you check out www.sprayers101.com. Pre-season is an important opportunity to ensure nozzles are performing as intended, so see the article on diagnosing nozzle output (sprayers101.com/adjust-the-direction-of-the-air-stream/).

In the case of conflicting instructions, always defer to the manufacturer's instructions for maintaining the sprayer. For more information on airblast sprayers, download a copy of **Airblast 101** here: (sprayers101.com/airblast-101-a-handbook-of-best-practices-in-airblast-spraying/)



Figure 14: Airblast sprayers, such as this John Bean, come in many forms. They may not match all of the maintenance steps listed here, but they all benefit from regular attention.

Announcements

OMAFRA IPM Scout Training Workshops for 2016

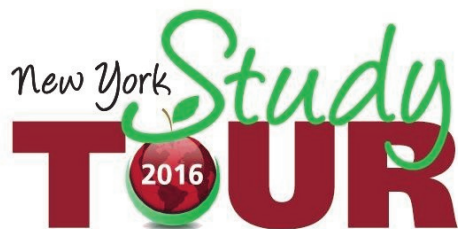
Refresh your knowledge of identification, biology and monitoring techniques for common insect and disease pests by taking an IPM Scout Training Workshop. OMAFRA specialists offer a series of free IPM workshops starting in late April and throughout the month of May. Lunch is on your own for all workshops and handouts are provided.

These workshops are available for those who will be scouting horticultural crops this year.

To register, please contact OMAFRA's Agricultural Information Contact Centre at 1-877-424-1300.

Workshop	Date & Time	Locations	Workshop Leader
Introduction to IPM	April 28 8:30 a.m. - 4:00 p.m.	1 Stone Rd, Guelph (P) Conference Rm 1, 2 & 3 First floor	Denise Beaton
Tomatoes & peppers	April 29 8:30 a.m. - 1:00 p.m.	PS003, Pestell Building, lower level, Ridgetown College See Resources for Vegetable Crop Scouts	Janice LeBoeuf
Apples	May 4 9:00 a.m. - 3:00 p.m.	Simcoe OMAFRA Resource Centre Auditorium (if possible bring copy of OMAFRA Pub 360 & Pub 310)	Kristy Grigg-McGuffin
Lettuce, celery, onions, carrots	May 9 10:00 a.m. - 2:00 p.m.	1 Stone Rd, Guelph (P) Conference Rm 3, First floor See Resources for Vegetable Crop Scouts	Mike Celetti
Tender fruit and grape	May 9 9:00 a.m. to noon	Vineland OMAFRA Resource Centre, Rittenhouse Hall <i>Bring laptop with WiFi capability</i>	Wendy McFadden-Smith
Sweet corn, peas and beans	May 11 9:30 a.m. to noon	Room 102, Rudy Brown Rural Development Centre, Ridgetown Campus	Elaine Roddy
Cucurbit crops	May 11 1:00 a.m. to 4:00 p.m.	Room 102, Rudy Brown Rural Development Centre, Ridgetown Campus	Elaine Roddy
Cole crops	May 12 10:00 a.m. - 2:00 p.m.	1 Stone Rd, Guelph (P) Conference Rm 3, First floor See Resources for Vegetable Crop Scouts	Mike Celetti
Strawberry and raspberry	May 18 8:00 a.m. - 4:30 p.m.	Simcoe OMAFRA Resource Centre Auditorium Required: OMAFRA Publication 360 (\$20)	Pam Fisher
Blueberry	June 1 3:30 p.m. - 9:30 p.m.	Simcoe OMAFRA Resource Centre Auditorium Required: OMAFRA Publication 360 (\$20)	Pam Fisher
Ginseng in field workshop	June 17 1:00 p.m. to 3:30 p.m. <i>(Rain date: June 20 - 1:30-3:30 p.m.)</i>	C&R Atkinson Farms Ltd. 228 Charlotteville Rd. 1, St. Williams	Sean Westerveld Melanie Filotas

(P) = have to pay for parking (\$12/day)



International Fruit Tree Association's Regional Study Tour is July 18-21. Rochester to Geneva, NY. For more information visit www.ifruittree.org/

Native Pollinators Project

The University of Guelph and Farms at Work is looking for farm cooperators across Ontario for a project involving monitoring of native pollinators on crops that need insect pollination including small fruits, cucurbit crops, field tomato and pepper crops and orchards. This project will focus on the native bees that are visiting these crops in Ontario to create a database of pollinators for each crop and each agricultural region of Ontario. Farmer cooperators will be asked to place traps in their crops during flowering and will be given feedback on the results specific to their farm as well as overall results. This project will benefit the agricultural community by increasing knowledge of the contribution of alternative pollinators to crop production."

For more information, contact Sue Chan at 705-652-0059 or sue@farmsatwork.ca.



Summary of Ontario Custom Farmwork Rates Charged in 2015 Now Available Online

Survey results of rates charged in 2015 by 220 Ontario custom farmwork operators are summarized on a provincial basis and also by 6 smaller regional areas. Where available the provincial average 2012 rates are also listed.

[www.omafr.gov.on.ca/english/
busdev/2015customrates.htm](http://www.omafr.gov.on.ca/english/busdev/2015customrates.htm)

Ontario Fruit and Vegetable Convention Presentation Slides Now Posted



Presentation slides from the 2016 Ontario Fruit and Vegetable Convention are now posted on the [OFVC website](http://www.ofvc.ca). Sessions at this year's OFVC included:

- Apples, Sweet & Hard Apple Cider, Tender Fruit, Berries, OFFMA, FMO, Winery, Grape, Hazelnuts, Specialty Vegetables, Vegetables, Growing Garlic Potential, Foliar Nutrients, Frost Protection, Bird and Wildlife Management, Sustainable Horticulture Production, Soil Health and Organic Matter, Food Safety, Business – Growth and Planning for the Future I and II, Precision Ag, Specialty Crops – How to Add Value to Your New Crop

Some presentations may not be available if presenters did not use slides or did not wish to have their presentations posted.

Agricultural Information Contact Centre: 1-877-424-1300

E-mail: ag.info.omafr@ontario.ca

Northern Ontario Regional Office: 1-800-461-6132

www.ontario.ca/omafr

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