

ONcore
For Commerical Apple Producers

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ORCHARD MANAGEMENT

Red Carpet Ready:
Tools to Improve Apple Blush

***Erika DeBrouwer**, OMAFA Tree Fruit Specialist*

Apple colour development is often a balancing act for Ontario growers. While markets demand strong blush, delaying harvest to enhance colour can increase the risk of quality deterioration during extended storage. This article highlights practical techniques growers can use to improve colour development while maintaining fruit quality for long-term storage. These options include an open canopy and adjusted crop load, reflective fabrics, leaf removal, plant growth regulators and nutrient management.

For use of any colouring method, remember that:
(i) **timing** is critical for all colouring technologies
and
(ii) **cool nights** are still needed for the success of any colour aid.

Open Canopy & Crop Load

Apple colour is strongly linked to light, meaning a well-lit canopy allows for better blush development. A large contributor to this is an open canopy. High density orchards can be managed in a way that allow for uniform light distribution throughout the tree, although this can be challenging.

Key management practices for an open canopy include the following:

- **Vigour control:** a balance of growth throughout the season is important, but too much growth can lead to overshadowing of fruit and require remediation. Be cognisant of nitrogen applications and knowledgeable of rootstock vigour. Use of plant growth regulators (PGRs) can also aid in vigour management.
- **Narrow canopy:** consider a narrow canopy to improve light penetration in the interior of the tree. Consider tools (hedging, PGRs) and timings (pruning, hedging, PGRs) to keep the canopy inside of the herbicide strip and row.
- **Renewal limbs:** consistently renewing limbs allows for better light distribution throughout the canopy and encourages younger and more fruitful shoot replacement limbs (limbs aged 2 – 4 years). Different cultivars may require alternate pruning strategies, check out Shaping Success: The Power of Apple Tree Pruning in 2024 Fall release of ONcore (Vol 28:4) for pruning methods and their influences.
- **Summer pruning:** removal of water sprouts, dense canopy areas and shading near fruit improve light exposure and colour development.
- **Tree height:** tall canopies will shadow limbs below, intercepting most of the available light. Maintain a height that works for your management, cutting back tops annually. Heading the tops of trees can lead to excessive growth, be mindful of the repercussions.

Proper crop load management has also shown to improve colouration indirectly through more efficient resource allocation, fostering a balanced canopy structure (vegetative and reproductive growth) and promoting a more uniform canopy light environment.

The **best option for ideal colouration** is to have an **open canopy** which allows for **even light distribution** and better **light penetration** throughout the tree canopy.

Reflective Materials

Traditionally referred to as reflective ground covers or mulches, these options are more accurately described as reflective materials. They are placed beneath trees and within orchard alleyways to reflect sunlight back into the lower and interior portions of the canopy, improving light distribution to shaded fruit.

These fabrics range in material, which can be woven or film, and colour, typically white, metallic (silver) or a



blend of white and metallic colours.

Impact of Colour

Although colour of the fabric is of the utmost importance, the result of efficacy in the orchard may surprise you.

Silver / Metallic objects are usually noted as the most reflective in terms of light. This is due to the almost mirror-like surface, but issues with using materials this colour in the orchard is not a reflectance problem, but moreso a geometry one. While silver or metallic materials can reflect large amounts of light, white reflective materials often provide more effective fruit colour enhancement because they both reflect and diffuse light throughout the canopy. Generally, objects in this colour:

- Showcase high light reflection
- Have concentrated narrow angles of reflected light
- Can generate hotspots and glare

White objects are known to reflect and scatter light. Although light reflectance could be lower in some cases when comparing white objects to silver/metallic objects; in the orchard white has been shown (dependent on the material) to outperform silver/metallic. Generally, objects that are white:

- Reflect light (potentially at a lower level than silver/metallic)
- Diffuse light in various directions
- Have a more uniform light distribution

Figure 1 highlights the contrasting light reflection characteristics of white fabric and metallic film.

Importance of Placement & Size

With the goal in mind of reflecting light, position and width of the materials play a role in how efficacious a product can be.

There are two options when distributing reflective groundcovers:

- **Row Middle / Alleyway** is the most common deployment method of reflective groundcovers, where fabric is laid between tree rows used for grass cover and machinery traffic (Figure 2).

  Benefits (+) and challenges (-) of placing reflective fabrics in row middles / alleyways include:

  - (+) Large reflective surface
  - (+) Easier installation and removal (compared to

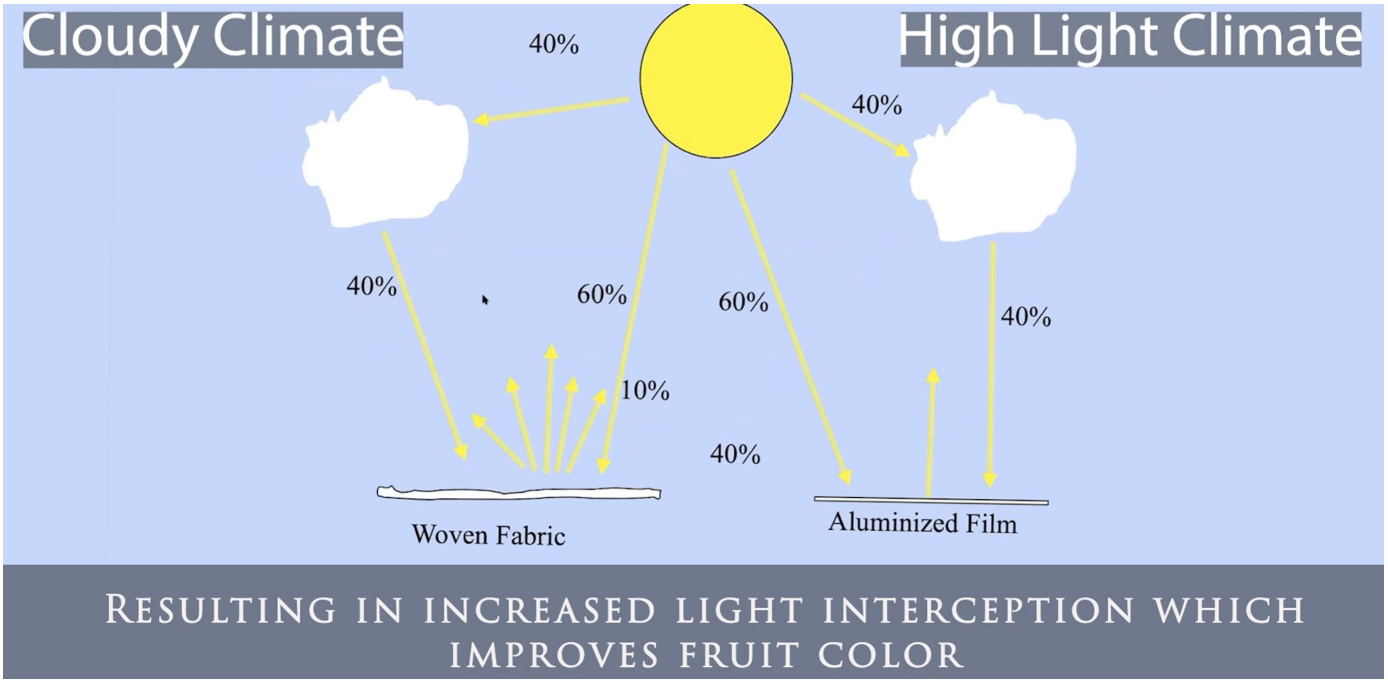


Figure 1. *Illustration demonstrating reflection and diffusion of light, in a New York State environment, comparing woven white fabric and aluminized film (Robinson, 2022).*



herbicide strip)

- (+) Potentially driveable (depends on product)
- (-) Farther distance from fruit
- (-) Machinery damage from driving
- (-) Grass maintenance
- (-) Labour needed can be considerable
- (-) Storage of materials (especially if reusable)
- (-) Cost can be significant

Herbicide Strip placement involves deploying reflective groundcovers directly beneath the tree canopy (Figure 3). Benefits (+) and challenges (-) of placing reflective fabrics in the herbicide strip include:

- (+) Efficient reflected light
- (+) Potentially less use of material
- (+) Reduced interference with operations (i.e. machinery, platforms, mowers, sprayers)
- (-) Potentially more difficult install
- (-) Irrigation interference and incompatibility
- (-) Risk of debris and moisture accumulation

Another factor to consider is the **width of the reflective fabric** (larger width needed for row middle / alleyway placement). Wider fabrics provide a larger reflective surface area, allowing more sunlight to be intercepted and reflected into the canopy, which can improve overall light distribution and promote more uniform fruit colour development. However, increased width is typically associated with higher material and installation costs, greater storage requirements, and increased exposure to machinery traffic, which may lead to additional cleaning, maintenance, or fabric wear.

Timing of Deployment

Growers in Ontario typically set up their reflective groundcovers 3 weeks to 10 days before harvest.

Types of Reflective Materials

Some materials can be driven over, moved throughout the harvest season to various cultivars, and re-used year after year, while others cannot. Common reflective materials used in apples include (i) white woven reflective fabrics and (ii) metallized plastic films. The



Figure 2. *Mylar® recently placed in row middle of Honeycrisp block.*



Figure 3. *Mylar® placed weeks prior along the herbicide strip of Honeycrisp block.*



Table 1. Comparison of common reflective fabrics used in apple orchard systems

Fabric Type	White Woven Reflective Fabrics	Metallized Plastic Films
Definition & Attributes	• Woven polyethylene/ polypropylene blends specific for horticultural use • Durable, reusable and water permeable • Reflect and diffuse light throughout the canopy (Figure 1) • Typically used for multiple seasons	• Thin aluminum-coated polyester/ polyethylene films • Highly reflective, almost mirror-like • Lightweight, shorter-term use • Reflection is directional (Figure 1)
Example(s)	• Extenday® Reflective Fabric • Lumilys® • ColorIt Reflective Cloth • Agritela Riflex, Agritela Lux	• Mylar® film • Extenday® DayBrilliant™, Extenday® Cool ColorUp™ • EasyColor Metalized Reflective Foil
Pros	• Proven improved and most consistent colouration • Durable and reusable • Tolerance of machinery and foot traffic • Proven economic return on high-value cultivars	• Very high reflectivity • Lower initial cost • Lightweight • Simpler deployment (easier install)
Cons	• Higher initial cost • Additional labour required for deployment, movement, removal (anchoring systems) in comparison to films • Storage needed	• Can tear more easily, less reusable • Susceptible to wind damage • Short lifespan • Typically require replacement (not necessarily repairable) • Performance decline with debris

characteristics, advantages, and limitations of both materials are summarized in Table 1.

White woven reflective fabrics have been scientifically proven to have higher light reflectance and consistent fruit colouration in comparison to **metallized plastic films**. This research has been demonstrated in New York and North Carolina over multiple years across various cultivars.

New York studied Extenday® and Mylar® across various tree training systems, showing that Extenday consistently showed higher light interception on sunny and cloudy days compared to Mylar®.

Overall, studies demonstrate that reflective ground covers can improve apple colour development when deployed under conditions conducive to colour formation and with sufficient time before harvest.

Leaf Removal

Another option to improve fruit colouring is leaf pruning and removal, which includes manual and mechanical defoliation.

Timing of the removal of leaves is critical to the success of apple colouration, as removal too soon can lead to sunburn damage, specifically photo-oxidative sunburn, and removal too late doesn't aid in colouration – resulting in a loss of time and money. For more information on sunburn damage see the article titled (SPF) Sun's Pretty Fierce: Understanding and Preventing Light and Heat Stress.

Manual leaf removal is when leaves are removed through use of pruners. It is commonly utilized in higher returning cultivars and takes place 2 to 3 weeks before harvest. Leaf pruning can be costly as it is labour intensive, expensive and difficult to time. Although there are challenges, the benefits include more precision and selectiveness based on cultivar and block.

Mechanical leaf defoliation is commonly performed using pneumatic defoliators, this approach follows the same principle as manual leaf removal and is typically reserved for higher-value cultivars where improved colour can increase returns. Pneumatic defoliators are used in lieu of manual leaf removal to reduce labour costs and improve operational efficiency. However, growers should be aware of the higher upfront equipment investment, reduced selectivity compared to hand removal and the potential for leaf and fruit damage.



The timing of these defoliators is also important, often taking place 10 to 8 days before harvest, with strong suggestions to not go earlier than 14 days before harvest.

When using pneumatic defoliators, consider:

- air pressure
- tractor speed
- distance from the tree

These settings should be adjusted to achieve the desired level of defoliation while minimizing leaf and fruit damage.

General recommendations for settings of pneumatic defoliators from the 2022 IFTA Conference include:

- To optimize defoliation, drive as close as possible to the canopy without striking it.
- Use air pressure at 0.7 bar (no higher than 0.8 bar) at 0.6 to 0.7 mph tractor speed.
- Remove up to 50% of the leaves to improve fruit color.
- Do not defoliate earlier than two weeks before harvest.
- Do not defoliate prior to bright sunny days after treatment to avoid photooxidative stress and sunburn.

No matter the leaf removal method, tailor the approach to the cultivar and orchard conditions, as results can differ between blocks.

Researchers based in Italy compared manual pruning, mechanical defoliation and control. They found that leaf removal, no matter the method, improved colour and were comparable in success.

Plant Growth Regulators

Plant growth regulators (PGRs) can be used in 2 different methods to improve colour of apples, indirect and direct. **Direct** methods include products that are specifically developed to enhance fruit colour, where **indirect** methods include products that could improve fruit colour, but are not the primary focus of the product. Further information regarding products used for fruit colouration can be found in Table 2.

For more product specific information check out the Crop Protection Hub.

Nutrients

Nutrients can support apple colouration through the accumulation of anthocyanins (red pigmentation). Below is a breakdown of nutrients and their roles in colouring:

Potassium (K) is involved in sugar transport which can enhance colouring through anthocyanin synthesis. It is critical that calcium is balanced with potassium for effective fruit colouration – especially due to the risk of bitter pit with high potassium levels.

Phosphorus (P) aids in energy transfer, root and shoot vigour, along with enzyme production – indirectly helping colouration. Foliar applications of phosphorus with magnesium or phosphorus with calcium have shown to aid in apple colouration.

Magnesium (Mg) is critical for chlorophyll and in turn photosynthesis. Magnesium indirectly supports colouring through healthy leaf tissues but is important to keep balanced when encouraging colouration.

Inconsistent and limited evidence has shown that **zinc** and **boron** could be related to colour improvement**.**

Excessive **nitrogen** inhibits colouration of apples and is well documented.

Avoid using calcium nitrate or chloride foliar sprays in the final 3 weeks leading up to harvest, as they interfere with colouring and leave residue on the fruit skin.

This article is not intended to be an endorsement or recommendation for a particular product or products but rather a ***sharing of information.***



Table 2. Colour improvement plant growth regulators that apple fruit colour directly and indirectly

Product	Active Ingredient	Role in Colouration	Typical Application Timing	Preharvest Interval (PHI)
Apogee	Prohexadione-calcium	• Indirect • May improve colour through shoot growth reduction and improved light penetration.	• First application when trees have 2.5 – 7.5 cm new growth • Make sequential application(s) 14 – 21 days apart, if required.	45 days
Blush	Prohydrojasmon 5.25%	• Direct • Stimulates anthocyanin (red pigmentation) production.	• 7 to 28 days before harvest	7 days
Blush 2X	Prohydrojasmon 10%	• Direct • Stimulates anthocyanin (red pigmentation) production.	• First application 28 to 21 days before harvest. • Second application 10 to 7 days before harvest.	7 days
Harvista 1.3 SC	1-methylcyclopropene 1.3%	• Indirect • Extends fruit hang time, allowing longer opportunity for colour development.	• Apply 3 to 21 days before harvest. • Delays maturation by 7 to 14 days.	3 days
Kudos	Prohexadione-calcium	• Indirect • May improve colour through shoot growth reduction and improved light penetration.	• First application when trees have 2.5 – 7.5 cm new growth • Make sequential application(s) 14 – 21 days apart, if required.	45 days
ReTain	Aviglycine hydrochloride 15%	• Indirect • Extends fruit hang time, allowing longer opportunity for colour development.	• Apply 3 to 4 weeks prior for single pick cultivars. • Apply 1 to 2 weeks prior to multiple pick cultivars. • Delays maturation by 7 to 10 days.	7 days

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(SPF) Sun's Pretty Fierce:
Understanding and Preventing Light and Heat Stress

***Erika DeBrouwer**, OMAFA Tree Fruit Specialist*

This article focuses on light and heat damage in apple fruit, outlining the causes, defining key sun damage terms, providing visual examples, and discussing approaches to reduce and prevent injury.

While sunlight is essential for life and fruit production, changing climate conditions and evolving orchard management practices in Ontario have increased the occurrence and visibility of light- and sun-related disorders in apples. Temperatures follow a similar story, where apples require dormant periods and warm periods for successful fruit to grow, but lately climate conditions have shifted, challenging growers in a multitude of ways.

Exposure to ultraviolet (UV) radiation can cause sunburn on fruit and sub-lethal injury on leaves. Leaves are typically more resilient in comparison to fruit as leaves utilize light energy (photosynthesis) and can dissipate light energy (transpiration), while excess light energy in fruit is converted into heat injury.

Burn Factors

Sunburn in apple fruit are caused by two direct factors, temperature and sunlight. It is debated which is more important when contributing to sun damage on the fruit, where it should be noted that findings change based on location of the research.

Temperature

When discussing temperature, we often think of air temperature; however, in this case, **fruit surface temperature** (FST) is the key consideration.

- FST is more related to sun damage risk than air temperature. This is due to (i) direct heat from the sun and (ii) heat from hot air moving into the orchard.
- High FSTs are common daily and not necessarily affiliated with an extreme event to cause sunburn necrosis or sunburn browning.

Fruit surface temperatures can exceed air temperatures by 5 to 15˚C.

Sunlight

Sunlight, scientifically referred to as solar radiation has a direct cause in sun damage to fruit.

- There are 3 types of radiation in the field that affect fruit (i) high energy UV spectrum, (ii) visible light and (iii) near infrared radiation.
- UV-B radiation is the most damaging to fruit and is required for sunburn browning.

Indirect Factors

Some contributing factors that could lead to sun damage include:

- **Humidity:** low humidity can increase stress on the tree, potentially making fruit more susceptible to sun damage.
- **Air movement:** poor air circulation can result in elevated FSTs, while increased airflow around fruit has been shown to reduce FST by as much as 5˚C.
- **Acclimation (fruit position):** without prior exposure to higher temperatures and sunlight, fruit is less able to tolerate these conditions and is therefore more prone to sun damage.
- **Cultivar susceptibility:** sun damage differs among cultivars, and early ripening cultivars may suffer substantial injury in one season yet avoid damage in another.
- **Geographic location:** tropical regions have shown to have higher sun damaged fruit in comparison to temperate regions of the world. For example, Washington State has noted that roughly 10% and up to 40% could be culled due to sun/heat stress.
- **Cultural management practices:** training system and tree architecture, row orientation, rootstock and cultivar vigour, water and nutrient management, pruning and leaf removal, all factor into sun damage risk.

Environmental conditions may be beyond your control, but the practices described in the "Dry Spell? Play It Cool" section can help protect fruit from sun damage.



Types of Sunburn

Several types of sun damage can occur on apple fruit, with the prevalence and severity varying by region. In Ontario, certain forms of sun damage are more common, and overall incidence is often greater in high density orchard systems due to increased fruit exposure to sunlight when compared to low density orchard systems.

It is important to note that these definitions reflect **fruit temperature**, not **air temperature**, as noted on the previous page.

I want to preface that the section below is highly based on information from Washington State.

Consideration of the climate differences, specifically our **temperature and humidity levels**, may change how and when certain sunburn damages show up in Ontario.

Sunburn Necrosis

Caused by heat alone.

- **Occurs when:** the fruit surface temperature exceeds 50˚C for as little as 10 minutes (under Washington conditions), causing cell death.
- **How it happens:** Caused by excessive heat and is exacerbated by low humidity.
- **Symptoms:** Cell death occurs, causing brown or black lesions.
- **Prevalence in Ontario:** Not common. Extremely high temperatures are necessary for this to occur.
- **Reference photo:** Figure 1

Sunburn Browning (Sunscald)

Caused by high fruit surface temperatures and damaging UV radiation.

- **Commonly occurs when:** a combination of UV-B radiation and high fruit surface temperature causing degradation of cell membranes. Sunburn browning can contribute to storage/delayed sunburn.
- **How it happens:** Typically occurs between fruit surface temperatures of 45 – 49˚C, although this can change based on the variety (i.e. Honeycrisp is more sensitive than Red Delicious or Braeburn).

  Higher risk occurs between the hours of 11am and 5pm when maximum daily air temperature and mean maximum hourly temperature are high.
- **What happens to the fruit:** Yellow, bronze or brown spot develops on the sun-exposed side of the peel but may not appear for a few days. Sunburn also affects the flesh of the fruit.
- Sunburn browning has **six different classes** based on severity (Figure 2). As sunburn browning severity increases (i) fruit firmness increases, (ii) soluble solids decreases, (iii) titratable acidity decreases and (iv) starch levels decrease.
- **Prevalence in Ontario:** Common. Can be seen in tops of tree canopies and when waiting for additional colouration before harvest.
- **Reference photo(s):** Figures 2, 3 & 4

Although you may see apples that exhibit necrosis, it most likely is **not sunburn necrosis**, but a **severe** incidence of **sunburn browning.**

Photo-oxidative Sunburn

Caused by visible light alone.

- **Defined as:** Shock exposure to visible light due to light intensity. Can occur at low temperatures (17˚C).
- **How it happens:** Risk factors include hand thinning, tree training, selective picking, summer pruning, branch movement and postharvest transit.

  Photo-oxidative sunburn has been seen across the province (particularly in 2026) in areas that have had 'overcast' conditions due to the smoke, with a sudden break and intense sunlight could have led to fruit sunburn.
- **What happens to the fruit:** Bleaching and eventual darkening of the peel.
- **Prevalence in Ontario:** Common. Although it is noted to have occurred after smoky conditions, it is more typically seen after leaf defoliation and summer pruning have been conducted.
- **Reference photo:** Figure 5





Figure 1. *Sunburn necrosis 'Pink Lady'. Source: Racsko, J., & Shrader, L. 2012.*



Figure 3. *Sunburn browning on Ambrosia, July 14, 2026.*



Figure 2. *Sunburn browning using the Schrader and McFerson System. Higher values mean greater damage (0 = none, 5 = necrosis). Source: Shrader, 2015.*



Figure 4. *Severe sunburn browning leading to necrosis of the fruit on Honeycrisp apples.*



Figure 5. *Photo-oxidative sunburn on Honeycrisp. The lower apple was exposed to light due to recent leaf defoliation.*



Sunburn Prevention Techniques

If your orchard is exposed to conditions that could increase sun damage risk, such as high sunlight, extreme weather (drought/heat), or certain management practices, proactive protection is key. Waiting until symptoms are visible often means the damage has already occurred. Keep your orchard chill by using the protective methods listed below.

Evaporative Cooling

Use overhead sprinklers or misters during peak heat hours to reduce canopy and fruit surface temperatures. Especially useful to prevent sunburn on fruit. Overhead irrigation works by reducing the air temperature due to water vapourization.

Evaporative cooling has been scientifically proven to decrease fruit surface temperatures (by up to 8.5˚C) and reduce sunburn damage incidence, but it does not reduce UV radiation – meaning that sunburn browning can still occur, along with photo-oxidative sunburn.

Evaporative Cooling	
Pros	• Decreased fruit surface temperatures • Reduced sunburn incidence • Effective during extreme heat events
Cons	• Expensive to install, maintain and operate • Access to water source (high volume requirement) • Water mineral deposits could be left on fruit • Timing is critical in efficacy of sunburn reduction

Protective Netting

Overhead netting reflects/absorbs sunlight and can reduce the impact of sun on exposed fruit. Colour of the net can influence growth, colour and quality of fruit (positivity or negatively), but can also prevent wind and/or hail damage.

Variable amounts of sunlight will be transmitted through the netting, where crystal white netting allows 95% and black netting allows 78%. This can vary significantly depending on the weave, material and colour of the netting.

Fruit surface temperature has been scientifically shown to be lower under protective netting, ranging between a 5˚C – 10˚C decrease.

Protective Netting	
Pros	• Decreased fruit surface temperatures • Reduced sunburn incidence • Can reduce effects of wind / hail damage • Net can influence growth, colour and quality
Cons	• Reduced red colour development • Expensive to install • Additional cost for deployment of netting • Learning curve for deployment and removal • Net can influence growth, colour and quality

Sprayable Sunburn Protectants*

Sprayable sunburn protectants use the application of material(s) on fruit to create a physical barrier that either block, reflect or scatter sunlight, depending on the product formulation. Kaolin clay, calcium carbonate or talc sprays are commonly used in apples to effectively lower fruit surface temperatures. These often require reapplication but can be utilized for spot treatments.

Kaolin clay products have been scientifically proven to reflect UV-B radiation but have also shown to reduce fruit size and colour. Calcium carbonate products have shown to reflect visible light, but not as effectively as kaolin clay products. Limited research has evaluated the reflectance properties of calcium carbonate and talc sprays across different types of radiation

**Most sunburn protectants have limited compatibility for tank-mixing with other products; consult product labels regarding best practices for product use.*

Sprayable Sunburn Protectants	
Pros	• Spot treatment (flexible and targeted use) • Less expensive than permanent infrastructure • Could be combined with other methods for sunburn prevention
Cons	• Could affect fruit size and colour • Not as effective as other options for fruit sunburn prevention • Reapplication is often required • Coverage is critical and timing can be uncertain • May be a hindrance for packer due to residue

*This article is not intended to be an endorsement or recommendation for a particular product or products but rather a **sharing of information.***



Dry Spell? Play It Cool

As heat stress can increase the occurrence of sun damage, it is important to be mindful of management practices that may either increase or reduce sunburn risk. The grower-controlled factors outlined below can **indirectly support sunburn prevention** either through moisture conservation, tree health and/or moderation of soil temperatures.

Adequate Moisture

Consistent moisture helps maintain cell turgor, supports active photosynthesis, and allows for active vascular system activity, which in turn prevents fruit shrivel and sunburn.

Irrigation: specifically, during dry periods is crucial in high-density apple orchards, where limited root zones and closely spaced trees increase vulnerability to heat stress.

- Drip irrigation: precision management and improved efficiency compared to overhead irrigation. Drip irrigation is preferred due to a reduction in evaporation.
- Pulse Irrigation: requires an automated system where water is applied in short, repeated intervals rather than one long, continuous session. Although not scientifically proven to decrease sunburn incidence, pulse irrigation can aid in maintaining a more consistent soil moisture and tree water status, supporting transpiration cooling to moderate fruit surface temperatures.

For best management practices for irrigation management, practical calculations and drip irrigation information, check out the following links:

- Irrigation Best Management Practices
- Drip Irrigation Scheduling
- Using ET Data to Make Irrigation Decisions
- Irrigation Scheduling for Fruit Crops
- Irrigation Timing in Fruit Crops
- 3 Secrets of Irrigation

Under Tree Mulching: organic mulches help retain soil moisture and reduce surface temperature beneath the tree canopy. Examples include:

- Grass clippings: proven to conserve moisture and moderate soil temperatures, although it can decompose quickly and promote certain pests.
- Straw mulch: is excellent at moisture preservation but could introduce weeds and harbour pests.
- Wood chips: moderates soil temperatures and provides good moisture retention but has a higher price and can immobilize nitrogen near soil surface.
- Living mulches/groundcovers: include an array of crops (grasses, legumes and broadleaves), which have been shown to reduce erosion and improve soil infiltration but can compete with trees for moisture. For more details check out Cover Crops in Apple Orchards: What You Should Know in the 2024 Spring release of ONcore (Vol 28:2).

Field Activity Adjustments

When able, during a heat stress event, delay non-urgent tasks like pruning/leaf defoliation or heavy equipment use until cooler periods occur. Avoid applying stress-inducing sprays during peak heat periods and take note of field activities that could prevent sunburn on fruit:

- **Summer Pruning & Leaf Defoliation:** exposes fruit which can be detrimental during heat waves, further increasing sunburn risk, specifically photo-oxidative sunburn. Delay if possible and only perform on cool days with 3 or 4 days of cool weather following.
- **Summer Hand Thinning:** also exposes fruit to the elements, follow summer pruning and leaf defoliation strategies.
- **Harvest Management:** consider harvest timings and fruit exposure when harvesting to further prevent sunburn incidence.
    - Mature fruit exposure: minimize time that mature fruit are exposed to severe weather, either through prevention methods listed in the previous section or by harvesting.
    - Selective harvest: can expose fruit that were previously shaded, take note of this if hot temperatures and strong light are forecasted.
    - Harvested fruit: move fruit quickly out of the sun, preferably into storage as soon as possible to prevent sunburn in the bin.



Nutrient Support

There is strong evidence suggesting that certain nutrients could aid indirectly in sunburn prevention, either through tree water relations, drought tolerance and/or physiological resilience. The main nutrients to focus on are potassium and calcium, although there is emerging research suggesting that boron, magnesium and zinc could also support fruit sunburn prevention. Ensure there are adequate levels of potassium and calcium available to the tree to help with plant stress tolerance and fruit integrity. Foliar feeding could be used when uptake through the roots is impaired.

Monitoring & Record-Keeping

Use soil moisture sensors, weather stations and scouting to make timely and proactive decisions. Track growing degree days and stress days to refine your response year to year based on yields, culls, economics and quality of fruit.

Sunburn Summary

Sunburn can occur at various temperatures and is affected by many environmental factors.

- Sunburn damage does not need an extreme event to occur on apple fruit in Ontario (see Figure 6).
- Consider proactive prevention methods if sunburn is of concern.
- Sunburn can be more damaging to fruit if there is a week of cool, windy, overcast weather followed by a hot (over 30˚C) calm day with full sunshine.
- Water stressed trees are more prone to sunburn damage.

Air Temperature	Risk Level	Meaning
≥ 40˚C	HIGH RISK OF SUNBURN NECROSIS	Extreme heat can cause sever cell damage and tissue death on the sun-exposed side of the fruit
≥ 35˚C	HIGH RISK OF SUNBURN BROWNING	High temperatures can cause browning of the skin and deeper tissue without cell death.
30 to 35˚C	VARIABLE RISK, DEPENDING ON OTHER RISK FACTORS	Risk is influenced by factors such as sun exposure, fruit orientation, cloud cover, humidity, wind and orchard management
Negligible	PHOTO-OXIDATIVE RISK, DEPENDING ON LIGHT	Risk is solely determined by sun exposure and fruit acclimation to the environment.

Figure 6. *Sunburn damage risk levels of apples in relation to air temperature.*

Are you interested in a **sunburn protection model**? If so, reach out to Erika through email or phone erika.debrouwer@ontario.ca, 226-931-4098

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Bitter Pit: Can We See It Coming?

***Erika DeBrouwer**, OMAFA Tree Fruit Specialist*

There are a few options available for growers to get a better idea of bitter pit pressure within their blocks before storage of apples occurs. There are 3 main methods being used:

- Passive Prediction Model
- Fruit Peel Sap Analysis
- Shoot Length

These methodologies are **not precise** (~65% accuracy), have shown to **underestimate** bitter pit across multiple regions and cultivars and have not been thoroughly researched in Ontario.

Recent research indicates that using **multiple prediction methods together** may improve the accuracy of bitter pit predictions. Growers should weigh the costs, time requirements, and management benefits of each method to determine the most practical approach for their orchard.

Passive Bitter Pit Prediction Model

The 'Passive Method' of bitter pit incidence was developed by Dr. Chris Watkin's out of the Cornell University research lab. This method, as described below, looks at a large sample of apples prior to harvest in hopes of estimating the total bitter pit occurrence in storage.

Passive Bitter Pit Prediction Methodology

1. Collect 100 fruit from representative trees in one block three weeks before harvest
   - Harvest fruit from as many trees as possible, with a minimum of 10 trees per block.
   - Blocks that have a variation in crop load, only pick fruit from representative trees AND/OR take separate samples from lower cropping trees.
2. Store fruit at room temperature (20˚C) for three weeks
3. Assess bitter pit (internal and external) of each sample
4. Express data as a percent for bitter pit incidence (shown in highlighted text box).

% of predicted bitter pit =

(amount of fruit with bitter pit ÷ total number of fruit) × 100

Passive Prediction Model	
Pros	• No lab costs or specialized equipment needed • Block specific information for storage decisions • Can be performed by an array of personnel (grower, consultant, storage operators)
Cons	• Takes 3 weeks • Requires fruit samples (destructive measurement) • Harvest timing is needed in advance • Can underestimate bitter pit • Primarily performed on Honeycrisp

Fruit Peel Sap Analysis

The Peel Sap Analysis is a newer test looking at the differences and ratios of calcium (Ca), magnesium (Mg), potassium (K), and nitrogen (N). This method was developed by Cornell University as well, but by Dr. Lailiang Cheng.

Fruit Peel Sap Analysis Methodology

1. Collect fruit samples (minimum 20, ideally 100) from representative trees in one block when the fruit is roughly 55 grams in size (golf ball size)
   - Harvest fruit from as many trees as possible, with a minimum of 10 trees per block, and no more than 2–3 apples per tree.
2. Send samples in labelled bags for lab, with the following information:
   - Name, Farm, Cultivar, Block, Date
   - If submitted multiple samples from the same block distinguish between them with identifier (i.e. low crop load, more vigour, rootstock).
3. Place samples in a cooler for transport. If needed, place bags in freezer for future transport to the lab.



4. After analysis occurs, look at K/Ca and N/Ca ratios and compare bitter pit risk as outlined in Table 1.

Table 1. Fruit peel sap analysis nutrient ratios and their risk indicators for bitter pit prediction (Cheng, 2025)

Risk	K/Ca ratio	N/Ca ratio
Low Risk	< 23	< 3
Moderate Risk	23–27	3–5
High Risk	> 27	> 5

Fruit Peel Sap Analysis	
Pros	• Results before harvest • Applicable for multiple cultivars • Useful for long-term management
Cons	• Laboratory costs and standardized sampling required • Cultivar and region may change thresholds • Can be inaccurate if used alone • Can require expertise for interpretation

Average Shoot Length

There is a high correlation of bitter pit incidence with excessive vegetative growth, this is due to competition between leaves and fruit for calcium. As a result, shoot length can serve as a useful indicator of bitter pit risk. Researchers at Penn State University developed a prediction model for Honeycrisp that incorporates both the fruit peel N/Ca ratio and average terminal shoot length, demonstrating that combining measures of tree vigour and fruit nutrient status can improve bitter pit prediction

Average Shoot Length Methodology

1. Three weeks before harvest select 20 representative trees per block
2. Measure the length (inches) of 5 current season terminal shoots from each tree
3. Determine the average length of shoot growth (shown in highlighted box)
4. Collect fruit samples for Fruit Peel Sap Analysis
5. Compare N/Ca ratio and shoot length to Table 2.

Average terminal shoot length =

total lengths (inches) ÷ total number of measurements taken

Table 2. Estimated percent of apples on Honeycrisp trees developing bitter pit after cold storage as affected by shoot length and N/Ca. (Marini, 2023)

N/Ca ratio	Average shoot length (< 5 in.)	Average shoot length (15 in.)	Average shoot length (> 25 in.)
2	0	20	59
6	0	28	67
10	0	36	75
14	5	44	83
18	13	52	91
22	21	60	99

Average Shoot Length & N/Ca ratio	
Pros	• More robust prediction when used in unison
Cons	• Limited research conducted for accuracy across regions • Requires additional test for improved accuracy • Laboratory costs and standardized sampling required • More time consuming than other tests

Bitter Pit Correlations

Across all three approaches, the strongest and most consistent bitter pit associations are: low crop loads, excessive vegetative growth, large fruit size, and calcium imbalance within the fruit. Rootstocks are a contributing factor and can either enhance or suppress bitter pit onset.

For additional information on bitter pit understanding and mitigation please refer to the following articles:

- A Pitfall in the Pipeline – Part I: Calcium's One-Way Ticket
- A Pitfall in the Pipeline – Part 2: Challenging the Pit Problem



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Pearls of Wisdom

Thirty years of *Orchard Network* is really a celebration of the people behind it. Thank you to the authors, editors, contributors, industry partners and growers who have shared their expertise over the years and continue to do so today. Their contributions have helped shape the newsletter into the trusted resource it is today.

John Gardner 1996 to 2008	**Ken Wilson** 1996 to 2001
Bernie Solymar 1996 to 2001	**Pam Fisher** 1996 to 1999
Paul Hagerman 1996 to 1999	**Kevin Schooley** 1996 to 1999
Annette Verhagen 1996 to 1999	**Margaret Appleby** 1996 to 2015
Leslie Huffman 1996 to 2015	**John Cline** 1999 to present
Jennifer DeEll 2002 to present	**Kathryn Carter** 2002 to 2011
John Henderson 2002 to 2011	**Michael Celetti** 2003 to 2018
Hannah Fraser 2003 to 2026	**Denise Beaton** 2006 to present
Christoph Kessel 2004 to 2019	**Anne Verhallen** 2009 to 2023
John Zandstra 2009 to present	**Jason Deveau** 2009 to present
Kristen Obeid 2010 to 2024	**Paul Bailey** 2011 to 2017
Kristy Grigg-McGuffin 2011 to present	**Amanda Green** 2014 to 2020
Katie Goldenhar 2019 to present	**Erika DeBrouwer** 2021 to present
Josh Mosiondz 2022 to present	**Danny Jefferies** 2023 & 2024
Steph Vickers 2024 to present	**Cesar Cappa** 2025 to present

Dates are solely based on articles and mentions within the ONcore (Orchard Network Newsletter).



CROP PROTECTION

Too Hot To Spray? Too Wet To Wait?

Managing Pesticide Decisions During Extreme Weather

Kristy Grigg-McGuffin, *OMAFA Horticulture IPM Specialist*

Weather has always been part of pest management. But as Ontario experiences more frequent extreme weather, such as intense rainfall or flooding, prolonged heat, drought, and strong winds, it is becoming an increasingly important factor in deciding when and how to spray. For example, heavy rainfall and wind can impede insect movement (think mites, moth flight, etc), challenge pesticide persistence (i.e., wash off, coverage) and increase disease pressure or spread. Meanwhile, prolonged periods of heat and drought can alter tree physiology, accelerate or cease pest development, affect spray performance, and increase the risk of crop injury.

With difficult conditions, come difficult questions: *Should a product be reapplied after rain? Will pests continue developing during a heat wave? When does tree stress impact efficacy of a product?*

The answer is rarely as simple as looking at the thermometer or rain gauge (or asking your favourite weather app). Successful pest management during extreme weather requires consideration of three interacting factors:

1. **How weather affects the pest.**
2. **How weather affects the product.**
3. **How weather affects the tree.**

Rain: Protection Meets Infection

Rain is perhaps the most obvious weather factor affecting product performance. But rainfall has two sides: it can reduce the amount of product on the tree, while also creating conditions that affect pest pressure.

Rain Vs Pest

For insects, rainfall can alter movement, activity and the timing of some development events. For example, spider mites can be washed off in heavy rainfall, moth pests don't fly in wet conditions, movement of plum curculio into orchards often follow a warm thunderstorm after petal fall, and apple maggot emergence depends strongly on sufficient soil moisture.

For disease, the relationship with rainfall is much more direct. Many pathogens depend on water for some part of their disease cycle. Rain can trigger spore release, dispersal and infection, while prolonged wetting can extend infection periods. Rain splash can move spores from infected tissue to healthy leaves and fruit, while wind and rain together can distribute inoculum throughout the canopy and to neighboring blocks.

Apple scab is a classic example: infection requires a wetting event, with free water on the leaf surface initiating germination and temperature determining how quickly the infection progresses. Other diseases, like black rot, bitter rot and fire blight are spread through rain splash during warm, humid conditions.

This means rainy periods can simultaneously increase disease pressure and decrease the protection provided by previous sprays. The combination is particularly important after extreme rainfall. During the flooding events in Niagara this summer, rainfall totals exceeded the amounts used in many published rainfastness studies (meaning everything was washed off), while flooded conditions allowed for sitting water around roots and delayed orchard access. That delay can give pathogens additional time to sporulate and infect tissue.

Rain Vs Product

Rainfall can reduce product residues through wash-off,



but the amount of rain alone does not determine whether an application has failed.

The greatest loss of residue generally occurs when rain falls shortly after application (within 24 hours), before the spray has had sufficient time to dry, adhere to the plant surface or move into plant tissue, depending on the product. Once a residue has become established, its ability to withstand rainfall depends on several factors, including:

- chemistry and formulation of the product
- plant penetration
- amount and timing of rainfall
- age of the residue
- environmental persistence
- inherent activity of the pesticide against the target pest

Research conducted by Dr. John Wise at Michigan State University has demonstrated that insecticides differ considerably in their susceptibility to wash-off. In general, products that remain primarily on the plant surface such as organophosphates are more vulnerable to rainfall than products that move into plant tissue such as spinosyns, diamides, avermectins, and some insect growth regulators. Even so, locally systemic or translaminar products including neonicotinoids are not immune to wash-off because some residue remains on the plant surface.

Tables 1 & 2 serve as a guide for general rainfastness to common insecticide groups.

The same distinction is important with fungicides. Contact fungicides such as Group M and many biologicals depend heavily on maintaining protective surface residue, while systemic or translaminar products such as DMI, SDHI and SIs may be less vulnerable once absorbed. But similar to insecticides, neither category should be considered completely "rainproof". Refer to Table 3 for type of fungicide activity of commonly registered products.

A general rule of thumb often used is that 1 inch (2.5 cm) of rain removes approximately 50% of protectant fungicide residues and over 2 inches (5 cm) of rain will remove most of the residue.

While the above is generally true, rainfastness can also be influenced by formulation, application rate, coverage, adjuvants and the amount of time between application and rainfall.

Rainfastness is not the same as residual activity.

A pesticide may remain on the surface after a rain event yet still have little effective residue remaining because the product was already near the end of its activity period. Most labels provide the interval between applications, or the length of residual activity under ideal conditions.

For more information on rainfastness of insecticides and fungicides, see *Pesticides & Rain: Ensuring Strengths in Storms* on the ONfruit blog.

Rain Vs Tree

Rain doesn't just remove what is already on the tree. It can change what needs protection. Rapid growth following good moisture can encourage expansion of new leaf, shoot, bloom or fruit tissue that wasn't present when the previous application was made. At the same time, prolonged wetness can increase the conditions conducive to disease development both within the canopy and in the roots. The result is a moving target: some existing protection may have been reduced while new susceptible tissue has developed.

Wind: Where Did the Spray Go?

Wind is often treated primarily as a drift concern. But in an orchard, it is also a coverage and deposition problem.

Wind Vs Pest

Wind can influence the movement and distribution of insects and can help disperse airborne pathogens, spreading spores from inoculum sources into nearby susceptible blocks, up to many kilometers away on strong currents. It's an environmental factor that can turn orchard IPM into a regional or neighbourhood issue.

A good example of how wind can aid in dispersal was the ash many regions saw in the air coming from the wildfires in the north this summer. With the ability to carry large particulates like that, imagine how easy a microscopic spore can travel.



Table 1. General rainfast characteristics for common insecticide groups registered in apples

Group	Rainfastness ≤ 0.5 inch (1.25 cm)		Rainfastness ≤ 1 inch (2.5 cm)		Rainfastness ≤ 2 inches (5 cm)	
	FRUIT	LEAVES	FRUIT	LEAVES	FRUIT	LEAVES
Carbamates (1A) Vydate, Sevin *(*chemical thinning only)*	M	M/H	M	M	L	L
Organophosphates (1B) Imidan, Malathion	L	M	L	M	L	L
Pyrethroids (3A) Danitol, Decis, Perm-Up, Poleci, Pounce, Ship, Up-Cyde	M/H	M/H	M	M	L	L
Neonicotinoids (4A) Aceta, Assail, Cormoran, Theme	M,S	H,S	L,S	L,S	L,S	L,S
Spinosyns (5) Delegate, Entrust, Success, GF-120	H	H	H	M	M	L
Avermectins (6) Agri-Mek, Minecto Pro	M,S	H,S	L,S	M,S	L	L
IGRs (15 & 18) Rimon, Intrepid, Confirm	M	M/H	M	M	L	L
Diamides (28) Altacor, Exirel, Harvanta, Shenzi, Vayego	H	H	H	M	M	L

H –highly rainfast (≤30% residue wash-off), **M** –moderately rainfast (≤50% residue wash-off), **L** –low rainfast (≤70% residue wash-off), **S** –systemic residues remain with plant tissue
*Table adapted from Rainfast characteristics of insecticides on fruit by John Wise, Michigan State University Extension

Table 2. Insecticide persistence, plant penetration & rainfastness rating

Group	Persistence	Penetration	Rainfast rating
Carbamates (1A) Vydate, Sevin *(*chemical thinning only)*	Short	Cuticle	Moderate
Organophosphates (1B) Imidan, Malathion	Medium-long	Surface	Low
Pyrethroids (3A) Danitol, Decis, Perm-Up, Poleci, Pounce, Ship, Up-Cyde	Short	Cuticle	Moderate-high
Neonicotinoids (4A) Aceta, Assail, Cormoran, Theme	Medium	Translaminar, acropetal	Moderate
Spinosyns (5) Delegate, Entrust, Success, GF-120	Short-medium	Translaminar	Moderate-high
Avermectins (6) Agri-Mek, Minecto Pro	Medium	Translaminar	Moderate
IGRs (15 & 18) Rimon, Intrepid, Confirm	Medium-long	Translaminar	Moderate
Diamides (28) Altacor, Exirel, Harvanta, Shenzi, Vayego	Medium-long	Translaminar	Moderate-high

*Table adapted from Rainfast characteristics of insecticides on fruit by John Wise, Michigan State University Extension



Table 3. Type of activity of common fungicides registered in apples

Group	Trade name	Type of activity
M	Copper, Copper Spray, Cueva, Dithane, Follow, Folpan, Kumulus, Maestro, Manzate, Microscopic Sulphur, Microthiol Disperss, Parasol, Penncozeb, Supra Captan	Contact
1	Senator	Locally systemic
3	Cevya, Fullback, Nova, Aprovia Top (3+7), Inspire Super (3+9)	Locally systemic
7	Aprovia, Excalia, Fontelis, Kenja, Sercadis, Luna Tranquility (7+9), Merivon (7+11), Pristine (7+11)	Locally systemic
9	Scala	Locally systemic
11	Flint	Locally systemic
19	Diplomat	Systemic
24	Kasumin	Locally systemic
25	Streptomycin	Locally systemic
29	Allegro, Downforce, Vantana	Locally systemic
39	Magister	Locally systemic
50	Property	Locally systemic
52	Migiwa	Locally systemic
BM	Blossom Protect, Double Nickel, Serenade, Serifel	Contact
BM	Ecoswing	Locally systemic
NC	Buran, Cyclone Plus, Milstop, Oxidate, Purespray Green Spray Oil, Suffoil-X, Vegol Crop Oil	Contact
P5	Regalia	Locally systemic
P6	Lifegard	Locally systemic
P7	Phostrol	Systemic
U12	Syllit	Locally systemic
U13	Gatten	Locally systemic

Contact = Stays on the surface of plant. **Locally systemic** = Moves into plant but does not move to other plant parts. **Systemic** = Moves into plant and to unsprayed plant parts as they develop.
*Activity based on classification from the Fungicide Resistance Action Committee

Wind Vs Product

With orchard sprayers, wind interacts with fan-generated airflow, canopy density, travel speed, nozzle configuration and droplet behaviour. Strong or gusty winds can carry spray beyond the intended target – or short of it, reducing deposition where it is needed and increasing off-target movement.

Wet or gusty conditions can seriously reduce coverage while increasing drift and runoff. It is important to adjust airflow and assess the actual coverage (in all parts of the tree!) rather than assuming the spray is reaching its target. For more information, refer to *Airblast Spraying in Poor Conditions*, *Ten Tips for Spraying in the Wind* (herbicide specific) and *Fundamentals of Spray Drift* on Sprayers101.com.

A product cannot protect tissue it never reaches.

In the last few years, I have commonly heard from growers surprised to find scab in their orchard, despite a strong fungicide program. Often, looking further into where this infection began suggested consistent wind and poor coverage to be playing a role in some escapes. Sprays weren't always reaching the upper canopy or penetrating into the dense canopy even with a well-calibrated sprayer.

Wind Vs Tree

Moving air increases evaporative demand of a tree and can increase water loss from leaves. In a well-watered orchard, this may be relatively manageable. In a drought-stressed tree, however, additional atmospheric demand can further increase stress.

Wind also changes how the canopy behaves during an airblast application. A sparse canopy provides less resistance to airflow, while a dense canopy intercepts more of the air and spray. As the tree canopy changes through the season, the same sprayer settings may therefore produce different coverage patterns.

Heat: Behaviour Changes

When high temperatures persist, the orchard's biological processes and environmental conditions begin to shift. Warm nights can keep pest activity going, while intense daytime heat and solar radiation place



additional demands on the tree. Humidity and soil moisture further influence how the orchard responds. In other words, a heat wave can change the conditions under which pest activity, product performance and crop response occurs.

Heat Vs Pest

When it comes to pest activity, heat does not necessarily mean slower. Our hot days with temperatures reaching 27-30˚C are still well within the favourable range for development for many pests. In fact, these conditions can accelerate degree day accumulation and likely advance pest development.

Insects and mites are ectothermic, meaning their development is dependent on external temperature. For common insect pests, including aphids, moths, leafhoppers, and scale, warm temperatures are more likely to increase development than suppress it. Warm nights are particularly important, allowing insects to continue accumulating degree days around the clock.

However, insects do not continue developing faster indefinitely as temperatures rise. While some insects adjust to heat by being less active during the hottest parts of the day such as plum curculio, temperatures generally need to exceed 32-35˚C for extended periods before significant reductions in activity or survival occur.

If running developmental models, consider including the maximum temperature thresholds when days are above 30˚C.

Some approximate maximum thresholds for common orchards pests include:

- Codling moth – 31˚C
- Oriental fruit moth - 32˚C
- Obliquebanded leafroller – 30˚C
- San Jose scale – 32˚C
- European red mite – 30˚C
- Two-spotted spider mite – 34˚C

In addition to impacting development, reproduction or survival, temperatures can also influence metabolic activity that can increase insecticide detoxification or toleration. For instance, toxicity to some organophosphate insecticides can increase with temperature, while pyrethroid toxicity decreases.

Disease responses are even more nuanced…

Apple scab, for example, still requires leaf wetness for infection. Infection is generally most efficient under moderate temperatures. Sustained temperatures over 28˚C become less favourable for ascospore survival, germination, and infection. However, there does not seem to be a specific temperature threshold above which infection ceases. If wetting events occur, infection remains possible, particularly during cooler overnight periods.

Bitter rot is a different story. Warm temperatures, high humidity, and mild nights create ideal conditions for infection. Temperatures between 25-30˚C are near optimal for disease development, especially if thunderstorms are in the forecast. Susceptibility studies led by University of Guelph in recent years have shown fruitlets can be infected with bitter rot shortly after petal fall; however, symptoms often do not become apparent for several weeks.

Heat Vs Product

Heat- and drought-stressed trees may have a reduced capacity to tolerate additional stress. Under these conditions, products that are normally safe can present a greater risk of leaf injury, fruit injury or other phytotoxic effects.

Risk can increase when:

- Temperatures are high and solar radiation is intense
- Warm nights provide little opportunity for trees to recover from daytime stress
- Trees are moisture stressed
- Fruit or foliage is directly exposed to intense sunlight
- Oils, penetrant adjuvants or other materials with known crop safety considerations are included in the tank mix
- Products are applied outside label-recommended environmental conditions

There is no single temperature at which every pesticide becomes unsafe. Crop safety depends on the product, formulation, rate, tank mix, cultivar, crop stage and



environmental conditions.

That said, when daytime temperatures climb into the 30s, careful consideration needs to be made when applying sprays. Making applications during the evening or overnight when temperatures are below 25˚C can reduce the risk of heat-related phytotoxicity.

To reduce the risk:

- Aim for 6-8 hours of drying time before temperatures begin to rise the next morning.
- Evening applications (e.g., 9:00pm – midnight) as temperatures begin to drop generally provide a greater safety margin than spraying just before sunrise.
- Keep tank mixes as simple as possible during periods of prolonged heat.

Heat does not automatically cause phytotoxicity. The risk increases when spray deposits remain wet as temperatures rise, trees are already heat- or drought-stressed, or products (especially captan, copper, or sulphur) are applied with penetrating adjuvants, crop oils or certain foliar nutrients that facilitate uptake.

Many systemic pesticides are generally well tolerated when applied according to the label. However, these products are absorbed most efficiently when the plant cuticle is hydrated. During prolonged hot, dry weather, uptake may be slower, making good spray coverage and appropriate application timing even more important.

Biological product efficacy may also be affected by prolonged hot, dry weather. Cooler evening temperatures and higher overnight humidity can improve survival and establishment of beneficial pathogens (ie., active ingredients in the biological products) on tissue surfaces, potentially enhancing their effectiveness.

Heat Vs Tree

Under hot, dry conditions, apple trees may reduce stomatal opening and transpiration to conserve water. At the same time, exposed leaves and fruit can become substantially warmer than the surrounding air, affecting photosynthetic activity and immune function.

Importantly, a tree can experience heat stress even when soil moisture appears adequate. High temperatures, intense solar radiation and dry air can create a high evaporative demand that challenges the tree's ability to maintain water balance.

Extended heat can contribute to:

- Leaf scorching
- Fruit sunburn
- Premature fruit drop
- Reduced shoot growth
- Reduced overall physiological resilience (ie., winter hardiness, etc)

A stressed tree therefore has a smaller margin for additional stress. This is particularly important when considering products or combinations that may cause crop injury under certain environmental conditions. For instance, products that activate a tree's own defence response, such as systemic acquired resistance (SAR) inducers, require the tree to divert energy toward defense rather than growth or stress recovery. During periods of prolonged heat or drought stress, when trees are already under physiological strain, consider whether the benefits of inducing defense outweigh the additional metabolic stress, particularly if disease pressure is low.

Induced resistance works best when the tree has the resources to mount a defense response.

Drought: Stress Adds Up

Drought is different from heat, although the two frequently occur together. A tree can experience high temperatures without severe water stress if adequate moisture is available. Conversely, moderate temperatures following a prolonged dry period can still leave trees physiologically stressed.

Drought Vs Pest

Many of our common orchard pathogens depend on rainfall, humidity or prolonged leaf wetness, so dry conditions can reduce opportunities for infection. But that does not mean disease risk disappears. The arrival of rain following a dry period can rapidly change the disease environment, particularly when inoculum is already present.



Insects and mites can respond differently. Hot, dry conditions can favour certain mite populations, while drought-stressed plants may also alter the severity of insect pests that attack stressed trees such as borers.

Drought Vs Product

Under hot and dry conditions, changes in leaf hydration and cuticle characteristics can influence how droplets spread, dry and penetrate the plant surface. Rapid evaporation can also concentrate spray residues. The magnitude and importance of these effects will vary depending on the product formulation, plant condition and application environment.

Foliar-applied pesticides generally enter plant tissues primarily through the cuticle rather than through open stomata. Once absorbed, movement within the plant depends on the properties of the active ingredient and whether it is capable of movement in xylem, phloem or only within treated tissues. Because drought stress can reduce transpiration, growth and vascular flow, it may influence the movement and redistribution of products that depend on these processes.

At the same time, reduced shoot growth can also change the need for protection of newly developing tissues.

This does not mean systemic pesticides stop working during drought. Rather, environmental stress can reduce the predictability of uptake and movement and reinforce the importance of good coverage, appropriate timing and maintaining tree water status wherever possible.

Drought Vs Tree

For the tree, drought is fundamentally a water-balance problem. Water stress can reduce cell turgor, alter photosynthesis and limit growth. It can also increase susceptibility to heat injury, cause growth cracks or splitting during moisture fluctuations that are susceptible to secondary infection, and reduce the tree's ability to recover from additional environmental or chemical stress.

The tree's condition matters when interpreting risk.

The same product applied to a healthy, well-watered tree and a severely stressed tree may not have the same crop safety outcome.

Before You (Re)Spray After Extreme Weather

When weather conditions disrupt a pest management program, consider the following before making the next application:

1. What is the current pest risk?

Don't make a management decision based on weather alone. Use scouting, traps, disease forecasting and pest development models or lifecycle information to determine whether the target is currently active and whether treatment is still justified.

2. What happened to the previous application?

Consider the age of the residue, drying time before rainfall, rainfall amount and the product's expected rainfastness and residual activity.

3. What condition is the tree in?

Look for signs of moisture stress, heat stress, sunburn or reduced growth. A stressed tree may respond differently to an application than a healthy, actively growing tree.

4. Are conditions suitable for another application?

Consider temperature, relative humidity, wind, expected rainfall and any specific environmental conditions that may impact product performance.

Weathering the Storm

Heavy rainfall can reduce pesticide residues while simultaneously increasing disease pressure and promoting new growth. Heat can accelerate the development of some pests and narrow management windows. Hot, dry conditions can affect droplet behaviour, spray deposits, plant uptake and the movement of some systemic products. At the same time, environmental stress can increase the risk of phytotoxicity and reduce the tree's ability to tolerate additional stress.

The most useful framework for making spray decisions during extreme weather is to consider three interacting factors:

1. How does the weather affect the pest?
2. How does the weather affect the product?
3. How does the weather affect the tree?



There is rarely a single answer that applies to every product, orchard or weather event. Understanding the interaction between these three factors — and using labels, scouting and pest forecasting tools to guide decisions — will become increasingly important as Ontario orchards continue to experience periods of intense rainfall, prolonged heat and summer drought.

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The table below was originally written by Ken Wilson, former OMAF apple specialist and one of the earliest contributors to the Orchard Network Newsletter. Following Ken's passing on August 7, 2026, we are honoured to share his words again and recognize the lasting impact he had on Ontario's apple industry.

A good apple grower makes money at harvest two ways: 1) The most obvious is from the sale of the fruit, 2) the other, less obvious way which escapes some growers, is in observing the subtle messages at harvest. - Ken Wilson, Sept 1997

PROBLEMS (Other than Insect & Disease)	POSSIBLE CAUSES	POSSIBLE CORRECTIONS
Small Apples	Crop Overload	More aggressive thinning Prune to reduce old spurs
	Lack of fertility	Improve fertility, esp. nitrogen Conduct leaf analysis
	Inadequate soil moisture	Supplemental irrigation Apply mulch Keep sod cover mowed short
	Too vigorous summer pruning	Reduce severity of summer pruning
	Poor pollination	Rent commercial hives
Soft fruit	Low magnesium (Mg), boron(B), potassium (K), calcium (Ca) Lack of Sunshine	Conduct leaf and fruit analysis
Russet injury	Slow drying of pesticides Caustic compounds, sulfur	Apply under better conditions Avoid caustic materials
Bitter pit	Low Ca and/or low B Lack of moisture Oversize fruit	Apply Foliar Ca and B Use irrigation, mulch Adjust crop load
Large fruit	Light crop Excessive fertility, esp. nitrogen Excessive moisture Excessive pruning	Pollen source and bees Conduct leaf analysis Avoid late irrigation Light annual pruning
Green fruit	Excessive tree shading Excessive fertility, esp. nitrogen Lack of sunshine Warm night temperatures Low Potassium (K)	Adjust pruning practices Conduct leaf analysis Reduce shading from obstacles Conduct leaf analysis
Bruising	Hot weather Soft apples Falling fruit from above Equipment tires and fenders	See above (Soft fruit) Stop drop sprays Stay out near harvest Prune away from equipment
Creased, grooved , misshapen	Poor pollination Winter injury to buds Frost damage at bloom	Use pollen source and bees Correct nutrient levels
Cracked apples	Low B	Variety specific esp. Russet
Calyx cracking	Cultivar problem, esp. Gala	Correct maturity
Drop easily	Overmature Not pruned Hot weather Clustered Young trees Low B, Mg, K, Ca Need stop drop	Starch Iodine Test Annual pruning More aggressive thinning Conduct leaf analysis Apply stop drop
Hard to pick	Immaturity	Starch Iodine Test
Holes in apples	Bird damage	Usually not severe



Perennial Weed Management in Apple Orchards

***Cesar Cappa**, OMAFA Weed Management Specialist*

As fall approaches, it is not only the trees that are shutting down. Weeds go through the same process, which involves an intense transfer of the products of photosynthesis down into the underground structures that let the plant survive the winter and produce vigorous, healthy growth the following season.

For most established perennial weeds, fall is the ideal window for chemical control. To get real control, killing the top of the plant is not enough. The underground portion often holds most of the biomass and it can easily regenerate new shoots (Figure 1). The only way to get an herbicide into those structures at a concentration high enough to kill them is a well-timed systemic application. Fall is generally an ideal time for that, since plants strongly mobilize material downward during this period.



***Figure 1.** Field horsetail quickly regrowing after a contact herbicide application.*

An application at this time may be well worth the effort, as perennials tend to make up the bulk of the weed pressure in established apple blocks with a well-designed residual herbicide program. These programs are typically very effective at preventing the development of annual weeds and the establishment of new perennials, but they are generally ineffective at controlling established perennial weeds.

> The best timing to **control a perennial weed** is **before it establishes**, that is, when it is still at the **seedling stage.**

At this point, the weed has not developed the extensive underground system that makes it so resilient later on. Soil residual and contact herbicides can give complete control at this stage, but it is generally short lived, because most species start building their perennial structures quickly.

The Tree Is Doing the Same Thing as the Weed

Unfortunately, because the **trees are running the same schedule**, this is also when they are most vulnerable to herbicides, and an incorrect application at this stage can lead to **severe and long-lasting tree damage.**

Glyphosate is the main concern. It is generally not recommended after late June or early July, since the potential for tree damage goes up later in the season it is used. Later applications may produce no visible symptoms while still leaving the tree weaker and more sensitive to cold injury and pathogens.

Some very experienced growers do perform spot applications after these dates. When a late application is truly justified, some will use backpack sprayers to target tough perennial weeds. If you follow that practice, it is important to understand that it carries a high level of risk, and that contact with suckers must be avoided.

It also helps to understand why this issue is easy to overlook: glyphosate does not cause visible injury every time a high-risk application is made. The damage is often inconsistent, which might give false confidence. A grower may get away with it several times and assume it is safe, only to find that a block has already been permanently affected.

One rule applies to glyphosate and 2,4-D alike. Do not spray immediately after cutting suckers, because freshly cut stems absorb systemic products readily.



Other systemic herbicides, such as 2,4-D and clopyralid (Lontrel), are not as risky as glyphosate and can be used post-harvest, but a high degree of caution is still warranted.

A few practical guidelines:

- Keep the spray coarse. Choose nozzles and pressures that minimize drift and use hoods wherever it is practical.
- Avoid spraying over suckers as much as possible.
- Apply while the weeds are still growing vigorously, are not under stress, and have not lost their normal summer green colour.
- Application on loamy sand or coarser soils or bare ground increases the risk of injury.
- Significant rainfall or irrigation in 10 days after application also increases the risk of root uptake.
- Some literature mentions Gala, Fuji and Golden Delicious as cultivars that could be more sensitive to 2,4-D than other cultivars.
- Do not let spray drift onto or contact foliage, fruit, stems, trunks or exposed roots.

The Window Closes at Hard Frost

When it comes to timing, the fall window closes when there is a hard frost. At that point, the weed's metabolism comes to a stop and movement of the herbicide within the plant is very limited. A light frost is not necessarily the end of the season but it's better to do it before then. What matters is whether the foliage is still green and actively growing. Once a hard freeze has come through, absorption drops and efficacy goes with it, so the application is no longer worth making.

You Need Foliage for Absorption

Adding another layer of complexity, good systemic herbicides uptake depends on lush, well-developed foliage, and that is often lacking in orchards that have been treated recently with contact herbicides for sucker control. This is especially true during the relatively short window when glyphosate applications are considered safe and perennial weeds are becoming susceptible in late June. Most growers will prioritize the timing of chemical sucker control over the ideal timing for perennial weed control, but it should be expected that applications made under these conditions will be less effective than those applied to fully developed, actively growing foliage.

Realistic Expectations

Even for the best-timed applications under ideal conditions, it is not reasonable to expect very high, durable levels of control from a single application. It takes a consistent, multi-year effort to deplete the reserves of these weeds. Often the applications will look excellent a few weeks after the application, but the weeds might be able to fully recover the following seasons if the efforts are not sustained.

One more caution before any tillage operation: take note of where creeping perennial weeds are located, particularly species that spread through rhizomes or root fragments. Cultivation can move these weeds around and facilitate their multiplication by creating numerous small root and rhizome fragments, each capable of producing new plants very effectively.

Common Orchard Perennial Weeds

Field Bindweed

This weed can develop very dense and competitive patches (Figure 2) and is very difficult to control because of the extremely extensive underground system it develops. It reproduces both vegetatively and by seed. Seeds germinate in spring and early summer and can persist in the soil for more than 50 years. It flowers from June through September.

The root system consists of vertical roots extending as much as 30 feet down, plus shallow horizontal laterals. Most parts of the root can produce buds capable of generating new plants.

Glyphosate and 2,4-D are both labelled for this weed in apples. The 2,4-D amine labels top growth control only. On the glyphosate side, Roundup WeatherMax lists field bindweed at full bloom or beyond. Up to 8 L/ha of this formulation is allowed in apples. That very high rate is certainly more effective on longer term control of bindweed but also represents a higher risk to nearby trees.

For this weed, sensitivity can vary widely from site to site depending on the environment and the genetics of



the population. As a result, it is possible to achieve excellent control in one orchard and very poor control in another, even under very similar conditions.

General principles to control this species are:

- Easily controlled as seedling, but only for about three to four weeks after germination. After the seedling stage it begins to generate perennial underground structures.
- Treat once flowering has started from June through fall.
- Plants stressed by drought or any other factor are much harder to control. Treatments applied to healthy vegetation with vigorous growth will be more effective.
- Plan on high-rate sequential applications and judge the result a year later rather than three weeks later.
- Expect site-to-site variation with glyphosate and consider 2,4-D if the pre harvest interval allows it.

Canada Thistle

This weed also has an aggressive growth pattern, with deep and persistent roots reaching as much as 3 m and producing adventitious buds (capable of producing new plants) that push up new shoots continuously (Figures 3 & 4). It is a prolific seed producer, and the seeds can remain viable in soil for more than 20 years.

Clopyralid (Lontrel) and glyphosate are both effective on this weed, but as noted above, no single application will be completely effective, and regrowth several weeks after treatment should be expected.

The Lontrel label indicates season-long control of top growth. However, at the 0.34 L/ha rate allowed for apples, not all rhizomes will be killed, and some regrowth may occur by the end of the season. Only one application is permitted per growing season. The ideal application timing is from the rosette to pre-bud stage when plants are actively growing and not under stress.

For glyphosate, Roundup WeatherMax lists Canada thistle at bud stage or beyond at 3.17 to 4.67 L/ha.

It's important to note that the development stages mentioned above **refer to the weed, not the trees**.



Figure 2. *Field bindweed patch in August.*



Figure 3. *Canada thistle sprout emerging from its perennial roots in an apple orchard during early spring.*



Figure 4*. Canada thistle patch quickly recovering after a contact herbicide application due to its strong underground reserves.*



The rosette stage occurs early in the spring (Figure 3), after which plants bolt and begin producing the flower buds referred to in product labels. In the fall, a second flush of growth will occur, especially after mowing or if herbicides were applied earlier in the season. The new rosette growth, accompanied by strong downward movement of sugars to the roots, increases herbicide absorption and translocation, making fall applications particularly effective.

Vetch

Vetch is a perennial weed, with new shoots emerging from underground roots throughout the season, starting as early as late April but most often in late May to early June (Figure 5).

Control of this perennial legume is poor with glyphosate, which is weak on legumes generally. Clopyralid (Lontrel) or 2,4-D should be the products of choice.

Vetch is also the exception to the fall-timing rule. In hairy vetch work, spring applications were consistently more effective than fall ones.

Horsetail

This primitive weed is extremely difficult to control because of its anatomy. It develops a very robust underground system of rhizomes and tubers that can reach 2 m in depth and accounts for roughly 85% of the plant's annual dry matter production. The aerial portion, in contrast, has a thick cuticle and a small surface area for retaining and absorbing product (Figure 6). Poor retention and poor translocation are the main reasons chemical control fails on this species. It reproduces by rhizomes and spores, and cultivation is ineffective, as is repeated mowing, slashing or burning.

It is also quite tolerant of systemic herbicides such as 2,4-D and glyphosate.

Casoron (dichlobenil) is not widely used, largely because of the impracticality of applying a granular product, but it does have activity on this weed and is registered on apples in Canada for application to the soil surface in late fall or early spring. Expect suppression rather than eradication. Dichlobenil reduces stand populations but applied alone it will not destroy the underground rhizome and tuber network.



Figure 5. *Vetch at base of apple tree in June. (Photo: K. Grigg-McGuffin, OMAFA)*



Figure 6. *Newly emerging horsetail in the orchard in May. (Photo: K. Grigg-McGuffin, OMAFA)*

Experienced growers know to expect regrowth even from the best applications. Neither chemical nor mechanical tactics are likely to achieve full control of horsetail, even after several applications.



In Short

- Fall is generally the best chemical window for established perennials, because that is when the plant is moving reserves down into the structures you need to kill.
- It is also the worst window for tree safety. Glyphosate should generally be finished by early July.
- 2,4-D and clopyralid are the postharvest tools applied with coarse sprays, hoods where possible, and no contact with suckers or trunks.
- Green, actively growing, unstressed foliage is a requirement for highly effective applications.
- Hard frost closes the window.
- Vetch is the exception. Target it in spring.
- Plan on several years to achieve sustainable levels of control.

Always read and follow the label.
Registrations and rates change; the label is the legal document.

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Blight Insight, Part 2

Common Questions and Key Management Considerations

***Kristy Grigg-McGuffin**, OMAFA Horticulture IPM Specialist*

Few diseases generate more questions from apple growers than fire blight. From predicting infection to pruning strikes and managing spread, growers are faced with complicated decisions throughout the season.

The answers to these questions lie in understanding how the pathogen, host, and environment interact to drive development. In Part 2, we continue to look at a few of the most common fire blight questions I've heard over the years and the science behind best management practices. Refer to *Part 1: Biology of Blossom & Shoot Blight* in the Spring 2026 ONcore Newsletter (Volume 30, Issue 2).

Pruning & Removal

When should I cut out strikes?

Unfortunately, there is no single answer. The decision depends on tree age, tree vigour, the number of strikes present, and whether weather conditions continue to favour infection.

Pruning fire blight strikes during the growing season can have two different outcomes:

1. Reduce inoculum and prevent the spread of disease
2. Increase shoot growth, making the tree more susceptible to fire blight.

Young, vigorous trees should generally be prioritized for strike removal. Fire blight can move rapidly from shoots into the leader, trunk, and rootstock, and infections can quickly kill the tree. Prompt removal of strikes can help prevent permanent structural damage and reduce spread to adjacent trees.

The decision becomes more complicated in mature orchards. In older vigorous trees with only a few infections, removing strikes may provide excellent control and help prevent disease spread. However, in older vigorous trees with many strikes, extensive pruning early in the season can stimulate a flush of succulent shoot growth, increasing susceptibility to further infection. In these situations, aggressive pruning may do more harm than good and major corrective pruning is often best delayed until dormancy.

Low-vigour trees behave differently. In slow-growing trees, or trees where shoot growth has been suppressed with prohexadione-calcium (ie., Apogee/Kudos), the pathogen is less likely to move rapidly into major limbs and trunks during the growing season. In these cases, cankers can be removed during dormant pruning rather than immediately.

When does the risk of spread stop?

Once terminal buds have set on apple trees, fire blight slows spread within infected trees. Summer pruning to increase fruiting wood in high-density orchards encourages new shoot growth and extends the susceptibility period for shoot blight. However, leaving the disease in the orchard may serve as a source of inoculum, and cause increased infections in the result of hail, severe storm, or high wind damage.

How far below a strike should I cut?

The fire blight bacterium often extends well beyond visible symptoms. Removing only the visibly affected portion of a shoot may leave infected tissues behind.

During the growing season, cuts should generally be made at least 30 to 45 cm (12 to 18 inches) below visible symptoms and preferably into second- or third-year wood (Figure 1). This reduces the likelihood of leaving systemically infected tissues in the tree.

When recommended cut distances are not possible without removing important structure, an "ugly stub" cut may be used. Leaving a short 10 to 12 cm (4 to 5 inch) stub away from structural wood allows the infection to remain isolated in sacrificial tissue that can be removed later during dormant pruning (Figure 2).

In young, vigorous trees where infection extends into structural wood, remove and destroy the tree. In older trees or if removal is unwanted, make the pruning cut well below the canker just above a suitably positioned lateral or renewal shoot to promote regrowth and allow selection of a new leader (Figure 3).

After making a cut, examine the cambium. Healthy cambium appears green (Figure 4A). If the cambium



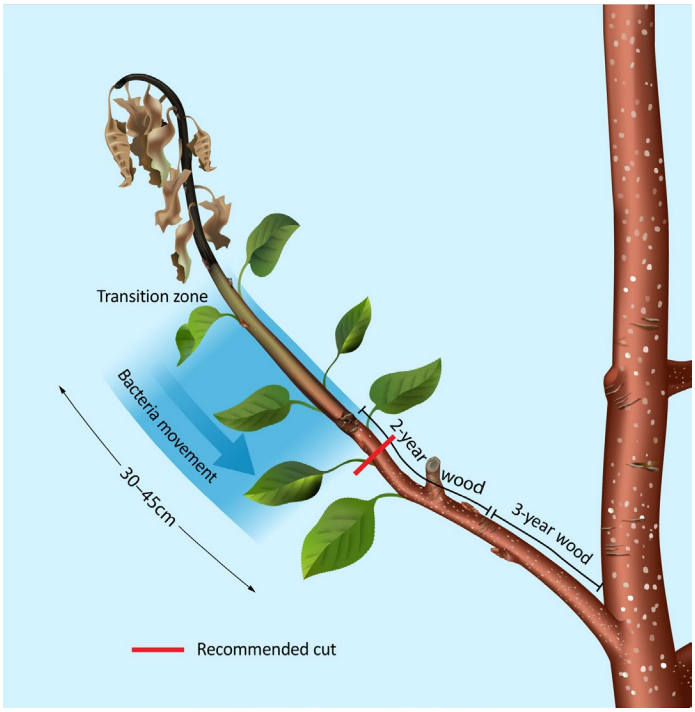


Figure 1. *Ideal pruning for fire blight management: Remove infected tissue by cutting at least 30-45 cm (12-18 in) beyond visible symptoms, preferably into 2nd or 3rd year wood.*

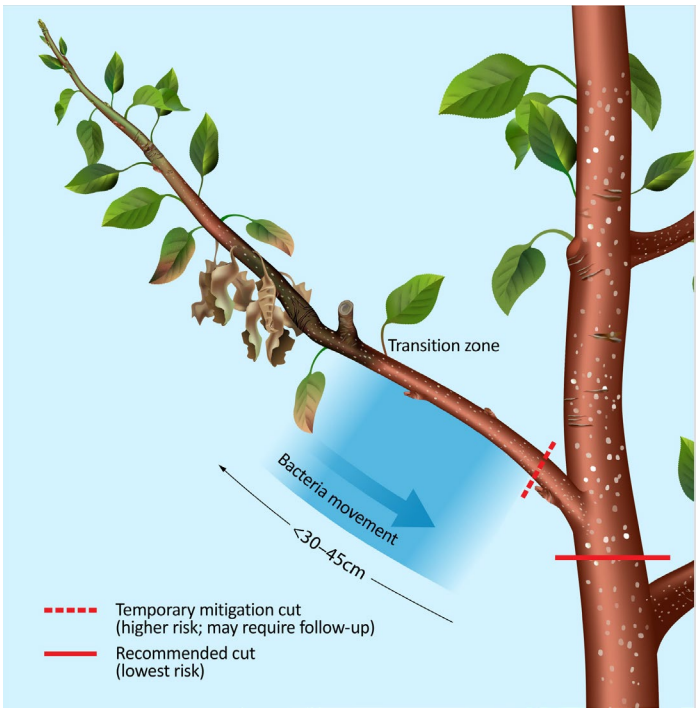


Figure 2. *Restricted pruning distance for fire blight: When recommended cut distance is not possible, an "ugly" stub (10-12 cm, or 4-5 in) can be left at junction with structural wood. Small cankers may reform and should be removed during dormant pruning.*

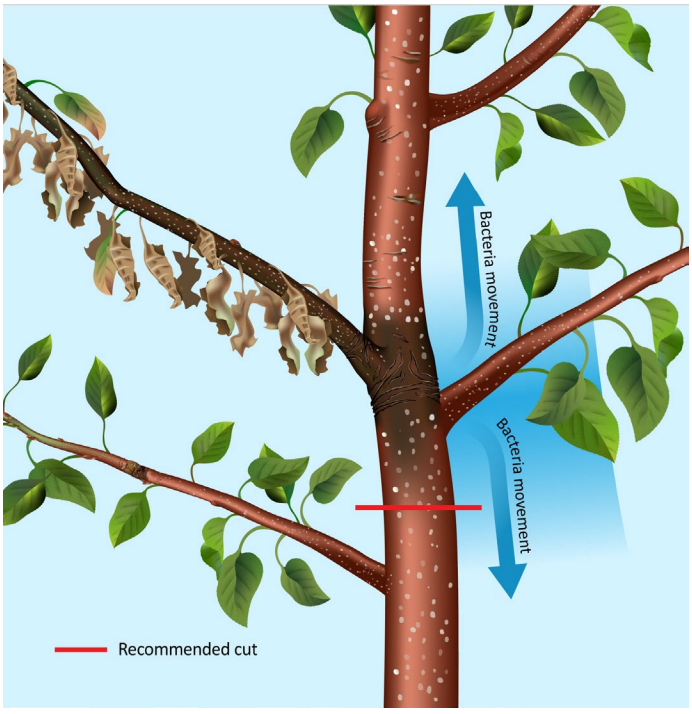


Figure 3. *Pruning fire blight with structural wood infection: When infection extends into structural wood, prune well below canker to a position that allows selection of a new leader.*

appears brown or discoloured, the infection has likely progressed beyond the cut and additional wood should be removed (Figure 4B).

Dormant pruning differs somewhat from summer pruning. Once the tree is dormant, the pathogen is largely confined to the cankered area and cuts can generally be made closer to visible symptoms.

Do I need to disinfect pruning tools?

Pruning tools can transmit fire blight bacteria when active infections or bacterial ooze are present. For this reason, many extension recommendations continue to advise tool disinfection during growing-season pruning.

However, recent multi-state research evaluating fire blight removal strategies found that tree survival was often similar whether pruning tools were sanitized between cuts or not. This suggests that factors such as timing, pruning distance and weather conditions may have a larger impact on management success than tool sanitation alone.



Figure 1. *(A, left) Green cambium of healthy shoot. (B, right) Cambium appears brown in fire blight-infected shoot.*

For young orchards, high-value blocks and situations involving active cankers or bacterial ooze, disinfecting tools remains a prudent practice. Growers should weigh the benefits against the practical limitations of slowing pruning operations.

If time permits, tools can be disinfected between cuts using 65-70% alcohol, a 10% household bleach solution, or disinfectant wipes.

Should pruning cuts be removed from the orchard immediately?

Where labour allows, infected pruning cuts should be removed from the orchard and destroyed/burned as soon as possible. Care should be taken to avoid brushing against healthy trees while transporting infected material. Some growers put pruning cuts directly in wagon or garbage bags to prevent ooze transfer (Figure 5).

If dry weather is expected, prunings may also be left in row middles long enough to dry before being flail mowed (Figure 6). As tissues dry and bacterial activity declines, the risk of further spread decreases substantially.

Should I prune during an active outbreak?

Proceed with caution.

Every pruning cut creates a wound, and moving through infected trees can increase opportunities for bacteria to spread. At the same time, delaying removal may allow infections to move into leaders, scaffold limbs, trunks, or rootstocks.

Trees most at risk, particularly young vigorous plantings, often warrant immediate action. Older trees with widespread infections may benefit less from aggressive pruning, especially when warm temperatures and high humidity continue to favour disease development.

If possible, schedule pruning when there are two to three consecutive days of lower humidity and temperatures below 25˚C. These conditions allow wounds to begin sealing without additional disease pressure.

Growers should also remember that summer pruning, including pruning intended to improve light penetration or increase fruiting wood, can stimulate new shoot growth and extend the period in which trees remain susceptible to shoot blight.

Tree & Orchard Factors

Which cultivars/rootstocks are most susceptible?

Susceptibility varies considerably among both cultivars and rootstocks.

Cultivars such as Gala, Fuji, Honeycrisp and Pink Lady are generally considered highly susceptible, while cultivars such as Empire often exhibit lower





Figure 5. *Fire blight infected pruning cuts bagged and immediately removed from orchard.*



Figure 6. *Fire blight infected pruning cuts left to dry in row middles before flail mowing.*

susceptibility. However, cultivar response can vary with tree vigour, crop load, weather conditions and inoculum pressure.

Traditional dwarfing rootstocks such as M.9 and M.26 have demonstrated high susceptibility in numerous studies, whereas many Geneva rootstocks were specifically bred for improved fire blight resistance. No cultivar or rootstock should be considered immune, but choosing resistant rootstocks can substantially improve orchard survivability during severe outbreaks.

For fire blight susceptibility ratings of common cultivars and rootstocks, see *Disease Susceptibility Ratings of Common Apple Cultivars* and *Insect and Disease Susceptibility Ratings of Common Apple Rootstocks* on the Ontario Crop Protection Hub.

Does nitrogen increase fire blight risk?

The fire blight pathogen infects young, succulent tissues much more readily than mature tissues. High nitrogen programs promote vigorous shoot growth and delay terminal bud set, extending the period during which shoots remain susceptible to infection.

Balanced fertility remains essential for orchard productivity, particularly in young plantings. However, excessive nitrogen can create ideal conditions for shoot blight development. Fire blight management should therefore focus on balancing growth and productivity while avoiding excessive vigour. Practices that suppress growth, such as prohexadione-calcium (ie., Apogee/Kudos), may help reduce shoot blight risk in susceptible orchards.

Can young trees recover from fire blight?

Minor infections can often be managed successfully if detected early.

However, young vigorous trees are especially vulnerable because fire blight can move quickly into the central leader and rootstock. Once structural components become infected, recovery becomes much more difficult and tree death may occur quickly.

For this reason, young orchards should receive priority when time and labour for strike removal are limited.

When should a tree be removed rather than pruned?

Removal should be considered whenever infections have progressed into major structural wood, such as the trunk or rootstock.

In young vigorous trees, infections extending into structural wood are often best managed by removing and destroying the tree. Attempting to salvage severely infected young trees frequently results in continued disease issues and poor structure.

In older trees, more aggressive corrective pruning may



be justified. Cuts can be made well below the canker to a suitably positioned lateral or renewal shoot, allowing a new leader or scaffold to be developed.

Tree removal should also be considered in orchard sections that experience severe infections year after year. In some situations, repeatedly pruning highly susceptible or chronically infected trees may be less economical than replacement.

Models & Forecasting

What does an infection event actually mean?

A fire blight infection event does not mean infection has occurred. It means all the biological requirements necessary for blossom infection are believed to be present simultaneously.

For blossom blight to occur, susceptible blossoms must be open, bacterial populations must build on flower surfaces, and moisture must allow bacteria to enter floral tissues. Forecasting models estimate when these conditions align and identify periods of elevated risk.

An infection warning should therefore be viewed as a risk prediction rather than a disease diagnosis. Infection can only occur if inoculum is present, susceptible host tissue is available and fungicide protection is lacking. Likewise, a forecasted infection event does not guarantee symptoms will eventually develop.

Why do different fire blight models give different predictions?

Different models use different biological assumptions and calculations.

- Maryblyt – incorporates factors such as flowering stage, bacterial population growth, wetting events, temperature and heat-unit accumulation
- CougarBlight – uses a different temperature-driven framework and incorporates orchard disease history when estimating risk

As a result, the same weather conditions may produce different risk ratings.

Differences in weather station location, forecast accuracy, bloom observations and local orchard conditions can further contribute to variation among model predictions. Forecasting systems should therefore be viewed as decision-support tools rather than absolute predictors of disease.

How accurate are forecasting models?

Forecasting models are among the most valuable tools available for fire blight management, but they are not perfect.

Models such as Maryblyt and CougarBlight have been extensively evaluated and generally provide useful guidance for identifying periods when blossom infection is biologically likely. However, studies have shown that predictive performance varies among regions, seasons and weather scenarios.

Their accuracy depends on reliable weather data, accurate bloom observations and an understanding of local orchard conditions. Models perform best when used in combination with scouting, orchard history, cultivar susceptibility and grower experience rather than as stand-alone decision-making tools.

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Barking Up the Wrong Tree

Managing Dogwood Borer in Apple Orchards

***Kristy Grigg-McGuffin**, OMAFA Horticulture IPM Specialist*

Dogwood borer (*Synanthedon scitula*) can be an easy pest to overlook — and it's not just because it is a clearwing moth (insect joke!). Until a tree starts declining and you find larvae tunnelling into the base of the trunk, its presence in an orchard can often go unnoticed.

In high-density apple orchards, dogwood borer is particularly associated with burr knots, cankers, trunk injury (winter, mechanical, etc) and pruning cuts. These damaged or weakened areas of the tree provide an attractive site for females to lay eggs and an entry point for newly hatched larvae.

Once larvae enter the tree, they are protected from most insecticide applications. This makes timing critical — but dogwood borer biology does growers no favours when it comes to finding a convenient spray window.

One Long Flight

Dogwood borer has one generation per year in Ontario. But that doesn't mean all individuals develop at the same time. Adults emerge over an extended period, laying eggs throughout the summer, and larvae remain inside the tree for much of the year. Research across five eastern states measured an **average flight period of more than 22 weeks**, with moth captures continuing into October in some locations. That's a long time for a pest to be flying, mating and laying eggs!

In Ontario, adult emergence begins in late spring, or mid-June and can continue into September, with peak flight in July. Females lay tiny, oval, light-brown eggs singly on the bark surface, particularly around burr knots or damaged areas since larvae can't chew through healthy, intact bark. Eggs hatch in approximately 8-9 days.

The newly hatched larva is the damaging stage for this pest. It quickly bores into the cambium and phloem layers and begins feeding within the tree, creating winding galleries. As larvae tunnel and feed, they push reddish-brown frass out of the feeding galleries – a useful sign when scouting (Figure 1). Larvae are cream-coloured with reddish-brown head capsules. They develop through multiple instars and overwinter inside their feeding tunnels, resuming feeding in the spring when temperatures raise above 7-10˚C. Mature larvae pupate in a silken cocoon near the bark surface in spring. Another sign when scouting are the leftover brown pupal cases visibly protruding from the trunk after the adult moth emerges (Figure 2).

Adults are clearwing moths that resemble wasps, with a dark blue-black body and yellow banding on the abdomen (Figure 3). They are relatively short-lived, but a female dogwood borer can lay over 100 eggs in her lifespan.

And that is where the dogwood borer management challenge begins.



***Figure 1.** Presence of frass and bark discolouration indicating dogwood borer infestation in graft union.*





Figure 2. *Pupal case of dogwood borer emerging from graft union of apple tree.*

A Moving Target

Trunk applications can be effective, but they depend on getting the product to the pest when it is exposed and vulnerable. Once the larva has hatched and tunneled into the tree, it will remain protected from any sprays or winter exposure.

Current products registered for dogwood borer in Ontario differ in how they work and are tied to egg laying and hatch rather than simply the presence of adult moths:

- **Pyrethroids (Perm-Up, Pounce)** – These products act primarily by contact, with some secondary action by ingestion and have a fairly short residual. Application should be made at the **beginning of egg hatch, or a shortly (7-14 days) following peak flight**.



Figure 3. *Adult dogwood borer. Note the dark margins around the clear wings, yellow banding on the abdomen, yellow legs, and tufted abdominal tip. Female dogwood borers (pictured here) have a thick lower abdominal band compared to the male. (Photo: bugguide.net)*

- **Rimon** – This product is an insect growth regulator (IGR) that must be absorbed by eggs to be fully effective. The optimal timing for this product is around **25-75% egg laying, or approximately peak flight**.
- **Delegate, Altacor** – These products must be ingested by the larva in order to work; therefore, application should be made at the **beginning of egg hatch, or shortly (7-14 days) following peak flight**.
- **Cormoran** – This product is a premix of Rimon and Assail, which means activity can be through both absorption by eggs and ingestion of larvae. Application can be **between egg laying (peak flight) and hatch (7-14 days after peak flight)**.
- With all products, a repeat application 14 days later is recommended.

Targeted sprays should be directed to the lower portion of the trunk, particularly the graft union and any pruning cuts. Many growers turn off upper nozzles and



use the lower nozzles of their airblast sprayer to drench the trunk and lower branches.

Monitoring adult flight with pheromone traps helps narrow this spray window. In orchards with a history of dogwood borer, place pheromone traps early to mid-June, before the beginning of adult emergence and monitored regularly (at least once a week). Trap captures can help identify when the orchard population is increasing, when peak flight occurs, and on-going flight activity. Track weekly numbers for signs of this peak and any further emergence.

Since adult emergence can continue for weeks after peak flight, new eggs will continue to be laid after the initial spray window. This is why consecutive trunk applications, 14 days apart may be needed. And for blocks with recurring dogwood borer pressure, repeatedly trying to hit egg hatch with trunk applications can become an extremely labour-intensive and expensive strategy. Not to mention potentially disrupting the beneficial insect population established in the orchard that time of year, depending on the products used (hello mite flare ups).

This is where mating disruption deserves consideration.

Mated & Confused

Female dogwood borers release a sex pheromone to attract males. Mating disruption dispensers release synthetic pheromone throughout the orchard, creating a pheromone-rich environment that interferes with the male's ability to locate females. The objective is not to kill adults or larvae. It is to reduce successful mating and therefore reduce the number of eggs produced and larvae entering the tree in the first place.

Think of it as *turning down the tap* rather than *mopping up the floor*.

Field research in several northeastern US states has shown that mating disruption can significantly reduce dogwood borer infestation. In Ontario, growers that have implemented this have seen great success in reducing the need for yearly trunk sprays. However, it is important to set realistic expectations: suppression develops over time and can be less effective than intensive trunk insecticide treatments, particularly when pest pressure is high or moths immigrate from surrounding untreated areas.

It's best to view mating disruption as a long-term population management strategy, rather than a rescue treatment for a block already experiencing severe infestation. In other words, you won't see results **within the first year** of using mating disruption.

Before Tying One On

There are several practical things to consider before committing to mating disruption.

Start before the moths start flying

Dispensers need to be deployed before adult emergence. For Ontario, this means planning for application by approximately the end of May rather than waiting for the first trap catch in June.

Once adult flight has begun, the opportunity to establish the pheromone environment before mating has already started has been lost.

Block size and shape matter

Mating disruption works best when pheromone coverage is sufficiently uniform across the treatment area. Small or irregularly shaped blocks (<4 ha) can be challenging, particularly where there is high pest pressure immediately outside the treated area.

This is because mating disruption does not stop a mated female from flying into the orchard and laying eggs. Research has demonstrated that movement of mated females from surrounding untreated areas can contribute to continued infestation even when male mate-finding is successfully disrupted within the treatment area. In other words, neighbours matter.

Where possible, treating contiguous blocks or coordinating with adjacent orchards can improve the likelihood of success.

Labour is still part of the equation

Dogwood borer mating disruption uses individual dispensers distributed throughout the orchard. The current Isomate DWB label specifies 250–375 dispensers/ha, with the higher rate recommended for



the initial treatment year or areas with higher pressure. The rate can be increased around orchard borders, up to 500 dispensers/ha.

As a quick calculation, at 375 dispensers/ha, a 10-ha block means placing approximately 3,750 dispensers. Mating disruption may eliminate repeated trunk applications, but it does not eliminate labour. Instead, the labour is shifted to an early-season deployment task that needs to be completed before adult emergence. That said, once they are deployed, the dispensers provide **season-long release**, aka one-and-done.

For growers considering mating disruption, this labour requirement should be part of the cost comparison — not an afterthought.

Don't expect an instant reset

Mating disruption is a **population-management strategy, not a knock-down treatment**. It reduces successful mating and therefore new infestation, but larvae already inside the tree are unaffected. This means growers should expect suppression to build over time rather than treating mating disruption as a one-season replacement for a trunk spray.

Which Strategy Makes Sense?

There is no single answer for every orchard! For a block with low pressure and a history of manageable dogwood borer, targeted trunk applications based on trap activity may remain a practical approach. For blocks with recurring pressure — particularly younger, high-density plantings with burr knot-prone rootstock, such as M9 or M26 — mating disruption may be worth considering as part of a longer-term program.

The strongest fit may be a combination approach:

1. Monitor!
2. Deploy mating disruption
3. Monitor!
4. Supplement with trunk sprays when necessary
5. Monitor!

Mating disruption can reduce reproduction over time, while targeted insecticide applications can help manage existing or incoming pressure during the transition or where pest pressure is high.

Fatal Attraction

Dogwood borer management ultimately starts with understanding why the orchard is attractive to the pest.

Burr knots are a major risk factor, particularly on susceptible rootstocks like M9 or M26. Research in young apple orchards has shown that infestation can begin during the first season after planting and increase over subsequent years, with the amount of burr knot tissue strongly associated with infestation.

Important signs to look for:

- Burr knots around the graft union and exposed rootstock
- Larval feeding and frass around damaged bark
- Declining trees, particularly where the cause is otherwise unexplained
- Previous dogwood borer infestations in the block
- Pruning wounds, cankers and other damaged areas (e.g., winter injury) that could serve as oviposition sites
- Increasing adult trap catches during June through September

And remember: finding a larva early in the season does not necessarily mean eggs were laid that spring. Dogwood borer overwinters as partially developed larvae inside the tree, so larvae found during the early stages of summer flight are the overwintering generation.

A Doggone Good Plan

Dogwood borer is a good example of why IPM is more than finding the right product.

Its long adult flight period makes a simple calendar-based trunk spray difficult. Its larvae spend much of their development protected beneath the bark. And once a population becomes established, the damage can continue before the problem is obvious.

For orchards with a history of dogwood borer, monitoring flight activity is still essential — but consider whether the goal should be to repeatedly chase egg hatch with multiple trunk sprays or to reduce the population's ability to reproduce.



Mating disruption will not be the right fit for every block. It requires advance planning, sufficient coverage, labour to deploy dispensers, attention to block size and surrounding sources of infestation, and patience while populations decline.

But where the conditions are right, it offers something a trunk spray cannot: **a chance to manage dogwood borer by interrupting the problem before the larvae ever reach the trunk**.

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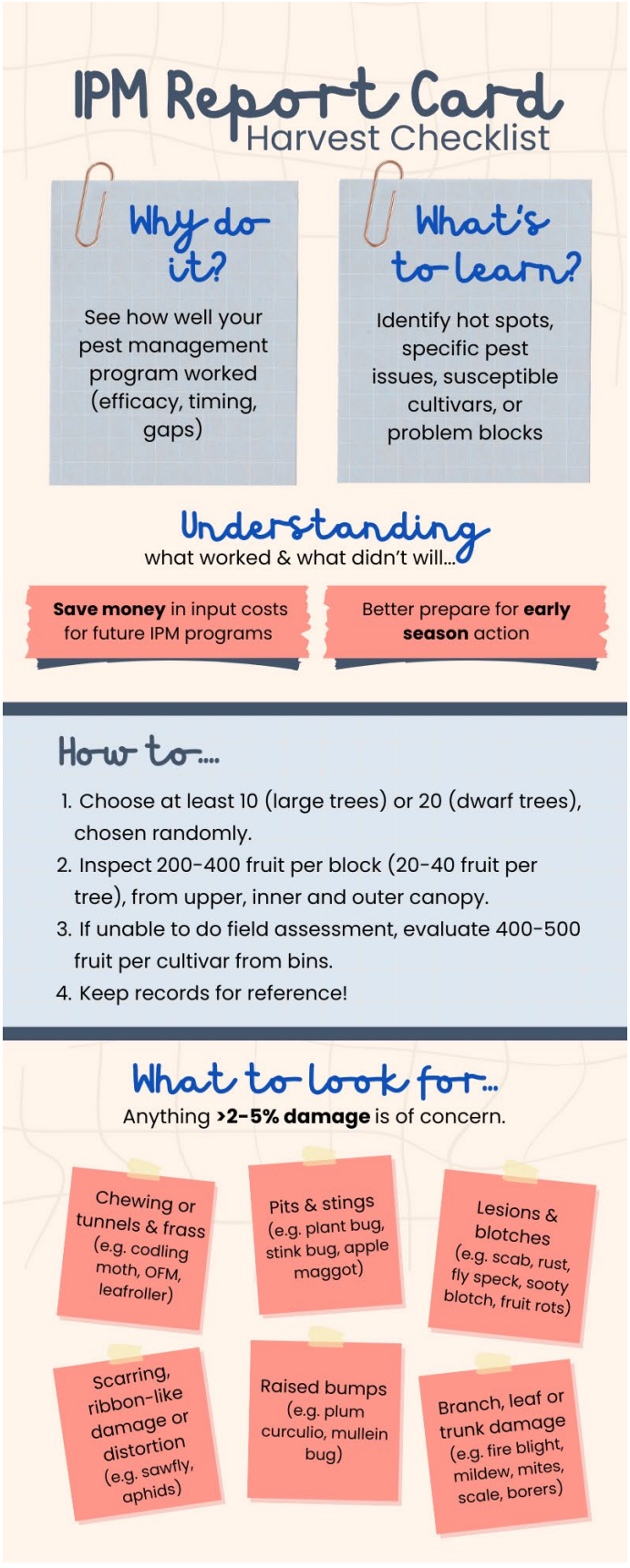
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POSTHARVEST

Lenticel Breakdown in Apples

From Orchard to Storage

***Dr. Jennifer DeEll**, OMAFA Fresh Market Quality Specialist*

Lenticels are small lens-shaped natural openings in the cuticle and peel of apples. These allow for gas exchange and transpiration. Lenticel breakdown is a physiological disorder, which is characterized by dark or blackened lenticels, or small superficial brown spots circling the lenticels (Figure 1).

Susceptibility to lenticel breakdown is often determined in the orchard, while symptoms usually develop after harvest and during storage (Figure 2). Lenticels begin to dry out and micro-cracks form, leading to sunken lesions and easy entry for pathogens. Lenticel breakdown typically develops due to climate and environmental conditions, spray damage and pathology.



***Figure 1.** Lenticel breakdown in 'Gala' apple after storage.*

Rapid temperature changes during the growing season can damage lenticels. Temperatures above 25˚C can also stress trees and cause apples to mature too quickly, resulting in reduced fruit quality, microcracks, and lenticel breakdown. Any rapid changes in weather that result in rapid fruit growth can increase risk.

Direct exposure to sunlight can also be stressful, as it weakens the lenticels and increases susceptibility to injury and breakdown. This is why lenticel breakdown often develops on the sunny side of apples, rather than the shaded side.

Unbalanced water retention in apples resulting from variations in water supply, like irregular irrigation or sudden heavy rainfalls, can cause internal pressure and subsequent microcracks. Calm winds and high humidity can also allow water to build up on apples because of poor evaporation due to lack of air movement.

Spraying in hot and sunny, humid weather with slow drying conditions can cause additional stress to the lenticels.

Adequate calcium levels are essential for stabilizing cell walls, which directly affects the integrity of apple tissue and lenticels. Mineral imbalances, such as high potassium and magnesium to calcium ratios ((K+Mg):Ca) and high nitrogen to calcium ratios (N:Ca), can also increase susceptibility to damage. Larger apples tend to be more prone to lenticel breakdown, while excessive pruning leads to moisture content variation and unbalanced minerals.

Chemicals used in dump tanks and packing lines, as well as soaps and detergents can increase the risk of lenticel damage. High phosphorus loads have been found to be associated with high incidence of lenticel breakdown. A large temperature difference between cold fruit and warmer water on the packing line will also exacerbate the problem.



Some apple cultivars are genetically more susceptible to lenticel breakdown, such as 'Gala', 'Honeycrisp', 'Ambrosia', and 'Golden Delicious'. Apples with high sensitivity to environmental factors, thin delicate skin, or large lenticels are inherently more prone to developing the disorder.

Advanced apple maturity at harvest results in higher susceptibility to lenticel breakdown.

Cell walls to tend lose structural integrity with age, leaving the skin and lenticels more vulnerable to microcracks and pathogens. Delaying harvest while waiting for color allows apples to continue ripening, which results in increased risk of lenticel breakdown. Similarly, delayed cooling and prolonged storage allows for continued fruit ripening and increased susceptibility.

Overall, adhering to good pre- and postharvest practices can help reduce the risk of lenticel breakdown. Harvest apples at optimum maturity, shorten storage duration for high-risk fruit, and minimize large temperature swings. Maintain consistent temperature and humidity levels in storage to reduce moisture-related stress, which can worsen lenticel breakdown. Ensure enough ventilation to keep the apples cold throughout the room and prevent hot spots. Controlled atmosphere and low oxygen levels will help reduce development of lenticel breakdown during storage.



Figure 2. *Lenticel breakdown in 'Honeycrisp' apple after storage.*



2026 Controlled Atmosphere Storage Guidelines for Common Ontario Apples

Dr. Jennifer DeEll, *OMAFA Fresh Market Quality Specialist*

Table 1. Oxygen, carbon dioxide, temperature and important notes for storage of common Ontario apple cultivars.

Cultivar	O_2 (%)	CO_2 (%)	Temperature (°C)	Important Notes
Ambrosia	1.2 – 1.5	1 – 1.2	0.5 – 1	• Slow cooling or conditioning necessary with 1-MCP • <1% O_2 possible with fruit monitoring (via DCA, etc.)
Cortland	1.5 – 2.5	1.5 – 2	0.5 – 2	• Higher temp with 1-MCP • Sensitive to CO_2
Crispin / Mutsu	1.5 – 2.5	1.5 – 2.5	0 – 0.5	--
Delicious (Red)	1 – 2	1 – 2	0 – 0.5	• <1% O_2 possible with fruit monitoring
Empire	1.5 – 2	1 – 1.5	2	• Extremely sensitive to CO_2 • Keep CO_2 <0.5% for 1st month if not treated with DPA
Fuji	1 – 2	0.5 – 1	0 – 1	• Sensitive to CO_2 • Delay CA 5-6 weeks with 1-MCP
Gala	1 – 1.2	0.5 – 1	0.5 – 2	• Higher temp with 1-MCP • Extreme regional differences • <1% O_2 possible with fruit monitoring, very tolerant to low O_2
Golden Delicious	1 – 2	1 – 2	0 – 1	• Slow stepwise cooling with 1-MCP • <1% O_2 possible with fruit monitoring
Granny Smith	1.5 – 2	0.5 – 2	0 – 1	• <1% O_2 possible with fruit monitoring
Honeycrisp	2 – 3	1 – 3	3 (after conditioning at 10°C for 5-7 days)	• Delay CA for 1st month if not treated with DPA • Extremely sensitive to CO_2
Idared	1.5 - 2.5	1.5 – 2.5	0 – 1	--
Jonagold	1.5 – 2.5	1.5 – 2	0 – 1	• Higher temp with 1-MCP
McIntosh	2.5	2 for 1st month, then 4.5	3	• Sensitive to CO_2 with 1-MCP
Northern Spy	1.5 – 2.5	1.5 – 2	0 – 0.5	• Sensitive to CO_2
Spartan	2 – 3	2 – 2.5	0.5 – 1	--

Updated and adapted in part from:

DeEll, J.R. 2020. Pome fruits: Apple quality and storage, p. 293-298. In: M.I. Gil and R. Beaudry (eds). Controlled and Modified Atmosphere for Fresh and Fresh-cut Produce. Elsevier Academic Press, United Kingdom.



EVENTS

Ontario Pest Management Conference
November 3, 2026

ONTARIO PEST MANAGEMENT CONFERENCE
EST. 2003

Get ready for the 2026 Ontario Pest Management Conference (OPMC)! This conference offers an exciting opportunity to learn about the latest strategies and technologies shaping integrated pest management.

With early-bird registration now open until **Friday, October 23**, it's the ideal time to secure your spot. Regular rates will be available online until the day of the conference. Tickets can be purchased here.

FOR MORE INFORMATION
www.ontariopmc.ca

Event Details

- **Date:** November 3, 2026
- **Time:** 8:30 am – 4:30 pm
- **Location:** Victoria Park East Golf Club, Guelph ON

THE NEXT IPM TOOLBOX:
Finding Tomorrow's Solutions

Featured Speakers

This year's lineup features industry experts who will offer valuable insights into the future of IPM solutions:

- **Dr. Doug Baumann** – Chief Technology Officer, Vive Crop Protection Inc. will explore ***Development Over Discovery: Protecting Crops with a Shrinking Active Ingredient Toolbox*** including how applying advanced formulation and delivery technologies to existing actives could fast-track access.
- **Dr. Ravi Ramachandran** – Head of R&D (Crop Protection), Syngenta Canada will focus on ***Novel Digital Approaches to Accelerate the Discovery and Development of Crop Protection Innovations*** for chemistry and biologicals.
- **Wayne Barton** – Development & Tech Services Consultant, GreenLight Biosciences Inc. will discuss ***RNAi Technology: Experience and Opportunities for Crop Protection in Agriculture*** and its potential to expand the future crop protection toolbox.
- **Josh Mosiondz** – Provincial Minor Use Coordinator, Ontario Ministry of Agriculture, Food & Agribusiness will examine ***The Dusts to Data: The Evolution of Pesticides***, a brief history of pesticide use in Canada, looking at new technologies, loss of technologies, present status and future directions.

Whether you are a seasoned expert looking to stay connected or a student eager to learn, we look forward to seeing you there!



Ontario Sweet & Craft Cider Competitions

Registration Opening Soon!

Calling all Ontario cider makers! Get ready to showcase your best ciders at the 2027 Ontario Cider Competitions at the Ontario Fruit & Vegetable Convention in Niagara Falls.

Ontario Sweet Cider Competition

Wednesday, February 17, 2027

Niagara Falls Convention Centre

This competition welcomes sweet ciders made with 100% Ontario apples – with medals awarded to the top entries.

NEW! This year, the Ontario Sweet Cider Competition will offer **two categories**: *Traditional Sweet Cider* and *Specialty Sweet Cider*. More information on eligibility for each category can be found on the Ontario Sweet Cider Competition website.

Entries can be shipped in advance or delivered in-person from 8:30-10:00am on the day of the competition.

Ontario Craft Cider Competition

Tuesday, February 16, 2027

Niagara Falls Convention Centre

Craft cider producers can enter up to **four categories** including *Modern, Fruit & Botanical, Hopped & Barrel Aged,* and *Traditional/Heritage* – all made with 100% Ontario apples. More information on eligibility for each category can be found on the Ontario Craft Cider Competition website.

Medals, industry recognition, and judging panel feedback are all on the line!

Entries must be shipped in advance.

Important Deadlines

ONLINE REGISTRATION – February 3, 2027

SHIPPING DEADLINE – February 10, 2027

Don't miss the chance to elevate your cider's profile and earn bragging rights across Ontario's growing cider community.

More Information

Registration will open end of September. Stay tuned to ONcore for more!

For full competition details, eligibility requirements and shipping information, click on the links below:

- Ontario Sweet Cider Competition
- Ontario Craft Cider Competition

Thank you to the Ontario Apple Growers and the Ontario Craft Cider Association for their continued support for these competitions!



ANNOUNCEMENTS

Ontario Soil & Crop Improvement Association:
Grants & Funding Opportunities

Ontario Soil and Crop Improvement Association (OSCIA) has a few programs that are currently open for applicants.

For more information, visit the 2013-2018 OSCIA Grants section on the OSCIA website.

Grassroot Funding Grants

Three programs funded in part by the Governments of Canada and Ontario under the Sustainable Canadian Agricultural Partnership (S-CAP) are accepting applicants.

Communication and Outreach Grants

The Communications and Outreach Grant supports part-time Regional Communication Coordinators across OSCIA's 11 regions to strengthen communication, knowledge sharing, and member engagement. Funding helps regional associations organize and promote events such as field days, tours, trials, and demonstrations, while also supporting administrative coordination.

The grant also enables the sharing of results and information through reports, articles, videos, podcasts, webinars, presentations, social media, and regional communications. In addition, it aims to grow membership and foster stronger local connections by providing meaningful activities and outreach opportunities.

A key focus is engaging youth and future agricultural leaders through partnerships with academic crop and environmental clubs, 4-H programs, and Junior Farmer organizations.

Collaborative Activities Grants

Collaborative Activities Grants are available to local and regional Soil and Crop Improvement Associations to support events and activities that focus on providing opportunities to transfer knowledge and share experiences with new technologies, production practices and sustainability.

Grassroots Research Grants

The Grassroots Research Grants support large-scale, three-year projects throughout the province, encouraging innovation and collaboration. The projects span across five major themes: soil health, sustainable crop production, economic and agronomics, emission reduction (greenhouse gases and carbon in cropping systems), or innovative cropping practice.

For further details of these programs either check out ontariosoilcrop.org OR read the guidelines booklet here: Supporting Grassroot Funding Guidelines: Collaborative Activities/Communication Outreach



Special Provisions for Financial Difficulties

Ontario farmers who are experiencing financial difficulty may qualify to access financial advisory services to complete a Farm Financial Analysis.

The Farm Financial Analysis:

- Provides a review of your farm business' past financial performance
- Provides an analysis of the current business climate
- Develops objectives and identifies options to meet profitability and sustainability goals.

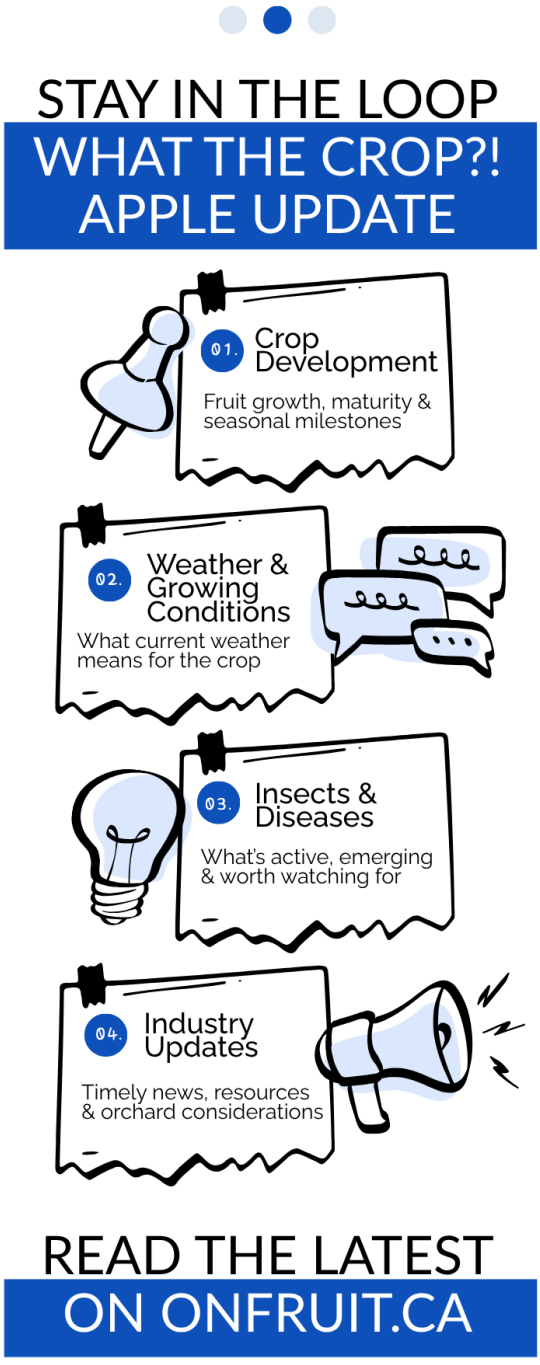
Eligibility:

- Be an established farm business that is actively farming in Ontario.
- Have a valid Premises Identification Number for the farm property where the proposed project will be implemented.
- Be experiencing financial difficulty and be able to provide supporting documentation with your application.
- Have identified a Farm Financial Advisor* to complete the Financial Analysis.

**Please note that Financial Advisors are not employed or approved by OMAFRA or by OSCIA in any way. Financial Advisors work directly with the farm business and do not market any specific programs. A resource for identifying a Farm Financial Advisor may be the Canadian Association of Farm Advisors (CAFA).*

Funded in part by the Governments of Canada and Ontario under the Sustainable Canadian Agricultural Partnership (S-CAP).

Further details can be found at Special Provisions for Financial Difficulties on the OSCIA website.





Agriculture & Agri-Food Canada

Agriculture Programs & Services

There are a few programs that are open for applications at the federal level as well. Some programs that may be of interest are described below.

Market Diversification for Small and Medium-Sized Enterprises

Targets opportunities in high-growth and non-traditional markets to increase and diversify exports and strengthen interprovincial trade across Canada's agriculture, agri-food and agri-products sectors (including fish and seafood).

Eligibility:

- You're one of the following organization types:
  - For-profit: Organizations that exist to make a profit.
  - Indigenous (First Nation, Inuit, Métis): A First Nation, Inuk (Inuit) or Métis individual or organization.
- You operate in the agriculture, agri-food and agri-products industry, including the fish and seafood industry
- You're directly involved in growing, harvesting, processing, or otherwise transforming or consolidating your products.
- You have less than 500 full-time equivalent employees
- You demonstrate how the project targets new opportunities in high-growth potential markets and non-traditional markets to increase and diversify exports and strengthen interprovincial trade
- You're a legal entity capable of entering into legally binding agreements

Further details can be found at AgriMarketing Program: Market Diversification for Small and Medium-Sized Enterprises on the Government of Canada website.

Canada Brand

Offers Canadian exporters a free digitally-optimized marketing toolkit and promotional opportunities in international markets to create a unified Canadian presence and increase the global appetite for Canadian products.

Eligibility:

To be eligible you must meet the following qualifications:

- Export-ready, registered Canadian business entity that has a role in producing or promoting Canadian agriculture, food or seafood products.
- Products are grown, raised or harvested, or processed in Canada.
- Produced in accordance with all relevant Canadian regulations related to exports.

Further details can be found at Canada Brand on the Government of Canada website.

Single Window Contact for Agri-Food Trade Service

Get in touch for export-related information and support. This service offers a single point of contact with the goal of helping the Canadian food industry and businesses reach international markets.

The single window can help you:

- Find the markets with the most potential for your business
- Address market access issues or barriers that could
- Block your products from reaching foreign markets
- Promote your products at key international trade shows
- Learn about activities to support the development of international markets for Canadian agriculture and food products
- Use the Canada Brand program to market your food products
- Leverage our international network of Trade



Commissioners and in-market experts

Further details can be found at Single Window Contact for Agri-Food Trade Service on the Government of Canada website.

Canadian Agricultural Loans Act Program

Makes loans available to farmers to establish, improve, and develop their farms and to marketing agencies to market commodities.

Eligibility:

- You're one of the following:
  - existing farmer
  - beginning farmer (less than 6 years of farming)
  - start-up agribusiness
  - farmer taking over the family farm
  - part-time farmer
  - agricultural co-operatives with a majority (50% + 1) farmer membership
- Your farm operation must meet the definition of "farmer" and "farming" as defined by the Canadian Agricultural Loans Act (the Act).

Further details can be found at Canadian Agricultural Loans Act Program on the Government of Canada website.

Farm Debt Mediation Service

Provides financial counselling and mediation services to farmers in financial difficulty.

The Farm Debt Mediation Service offers 2 options:

1. Financial counselling and mediation **with** a stay of proceedings 5(1)(a): **This option includes a temporary halt on legal actions by creditor(s)** while mediation is ongoing
2. Financial counselling and mediation **without** a stay of proceedings 5(1)(b): **This option does not include a halt on legal actions**, but still provides a platform for mediation between the farmer and creditor(s)

A qualified financial consultant will be assigned to work with you throughout the mediation process.

Further details can be found at Farm Debt Mediation Service on the Government of Canada website.

For a **full list of agricultural programs and services** available through Agriculture & Agri-Food Canada click the following link: https://agriculture.canada.ca/en/programs

New **Productivity Mega Deduction** announced for 2026–2027 fiscal.

Pending Parliamentary approval, farmers who purchase eligible equipment or technology on or after September 15, 2026, may be able to deduct the full cost from their taxable income in the year it is put into use, rather than claiming the deduction over several years.

From a farm investments standpoint, it could include the following:

- farm machinery
- farm equipment
- farm vehicles
- ag-tech hardware
- ag-tech software
- technology investments.

Ineligible investments include:

- farm buildings (storage, packing, shops, etc.)
- improvement to farm buildings
- passenger vehicles



Pollinator Partnership Canada
Pollination Survey

Pollinator Partnership Canada is inviting Canadian apple growers to participate in a national survey about the pollination management approaches currently being used in orchards.

The survey will help identify:

- Current apple pollination practices;
- New and innovative approaches being used by growers; and
- Unmet needs that future programs, tools and research may be able to support.

The survey should take **approximately 10–15 minutes** to complete, where all responses will be used in aggregate to help inform future work. If you have any questions about the survey, please reach out to:

Jordan Phelps – jordan@pollinator.org

Gavin Hossack – ghossack@pollinator.org

Pollinator Partnership Canada is a national non-profit and charitable organization focused on protecting pollinators, plants and the ecosystems they support. The organization works with farmers, gardeners, land managers, scientists and industry partners to address threats including habitat loss, climate change, invasive species and pesticide exposure.

POLLINATOR PARTNERSHIP CANADA

You can access the survey using the link or the QR code below:

https://form.jotform.com/261585862694271

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