



CROP PROTECTION

Following the Fire: Latest Research for Fire Blight Management

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Fire blight continues to be one of the most economically damaging diseases for apples – especially in young, high-density plantings. Warmer, more erratic spring weather has increased the frequency of high-risk infection periods, while vigorous growth in high density systems allows the fire blight pathogen, *Erwinia amylovora* to move rapidly through trees.

Recent research presented at the 2026 Fire Blight Fruit School, hosted by Washington State University highlighted how a better understanding of the biology of fire blight, environmental influences, and available management tools can help growers stay ahead.

Why Shoot Blight Is So Destructive

Once fire blight moves from flowers into shoots, the game changes. Inside a growing shoot, *E. amylovora* no longer sits on exposed surfaces where sprays can reach it. Instead, the pathogen multiplies and migrates through the cortex into woody tissue (Figure 1).

Most products that work well on flowers or surfaces **don't reach** bacteria once they're inside the tree. That's why success hinges on **prevention** during high-risk blossom and shoot blight infection periods and **quick removal** in-season once strikes appear.

The conditions during the Ontario growing season are very conducive to shoot blight infection – *don't allow it the chance to spread!*

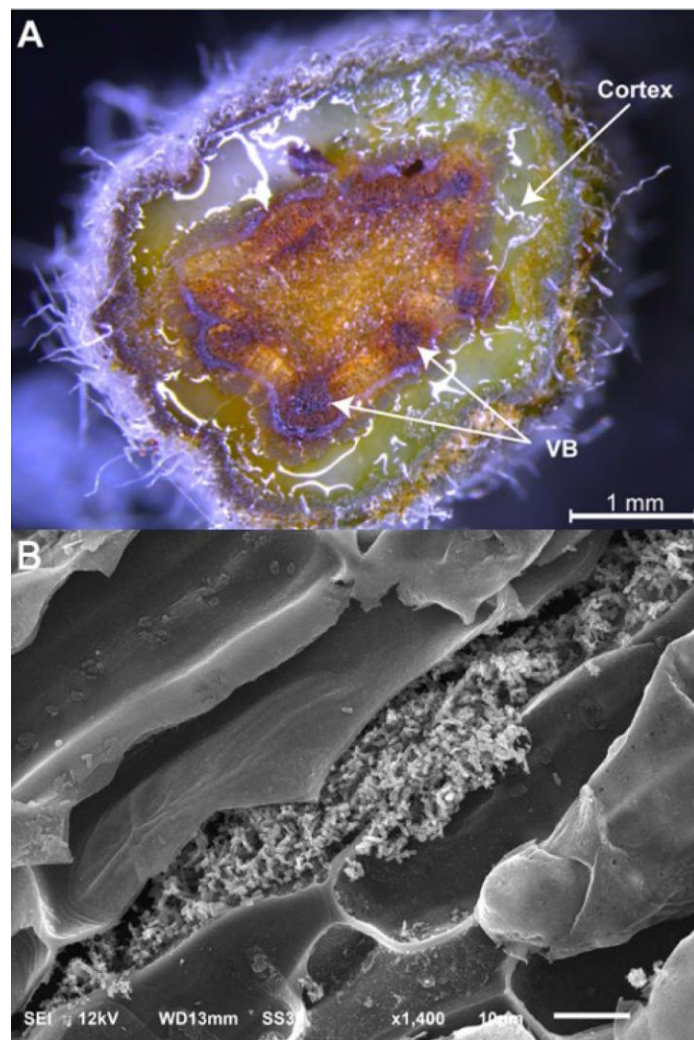


Figure 1. Micrographs of infected shoot tissue. (A) shows immature ooze developing in the cortex and necrosis in the vascular bundles (VB). (B) shows the buildup of bacterial cells and ooze bursting through plant cells. (Photo: K. Dougherty, Michigan State University)

Rapid Multiplication

E. amylovora can reach $>10^9$ cells per gram at the shoot tip **before** classic symptoms appear. This means infection can be well established by the time you first notice a shepherd's crook.

Fast Internal Spread

New research has determined the bacteria can move internally through shoots at an average rate of **5 cm (2 in) per day**, up to 10-12 cm (4-4.5 in) per day (Figure 2).

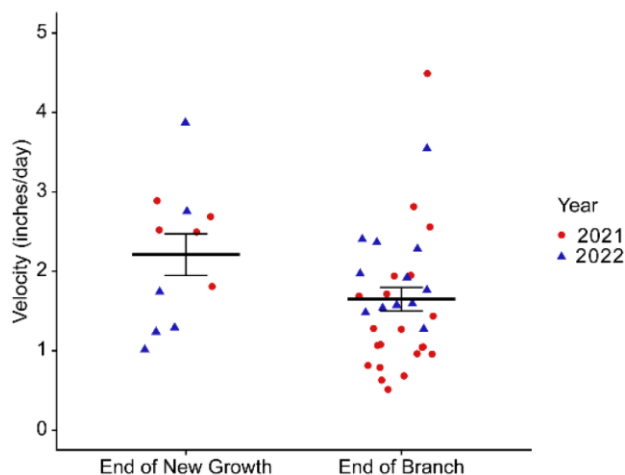


Figure 2. Velocity of *Erwinia amylovora* detected at the end of the new growth and at the end of the branch.

Ahead of Symptoms

E. amylovora has been detected at the start of 2-year wood and even at branch/trunk junctions **days before** visible symptoms develop. This explains those "surprise" cankers that show up after you've already pruned; it was way ahead of you!

Systemic Movement

Once in woody tissue, the pathogen population can move internally towards the roots and **initiate rootstock blight**. Young, high density trees are especially vulnerable:

- Rapid shoot growth creates continuous susceptible targets for infection.
- The short distance from shoot tips to the central leader speeds systemic spread.
- The step from rootstock blight to tree death can be fast – often outpacing the window where pruning could have saved the tree.

Defense Elicitors: Refining Their Role

Multi-state field trials evaluated the use of plant defense elicitors (also known as Systemic Acquired Resistance or SAR) and growth regulators for slowing systemic infections after bloom.

Two main actives evaluated were:

- Prohexadione calcium (e.g., Apogee, Kudos) – reduces shoot growth and strengthens cell walls, slowing bacterial movement.
- Acibenzolar-S-methyl (e.g., Actigard) – stimulates the tree's natural defense response.

Across locations, cultivars, and years, low rates of **prohexadione-calcium alone or in combination with Actigard consistently reduced shoot blight severity**, especially under low to moderate disease pressure.

Actigard is **NOT** registered for use on apples in Canada. Due to the current registered uses, the Pest Management Regulatory Agency has determined that the total allowable health risk has been reached, or the "risk cup" is full and no new uses (e.g., a new crop) can be added to the label.

Several alternative SAR products are registered in Canada and may provide similar – though generally less consistent – benefits when used preventively and as part of an integrated program.

This includes:

- **LifeGard WG** (*Bacillus mycooides*) – a biological plant activator that stimulates host defenses. LifeGard works best when applied before infection, as it takes several days for full defense activation. It is most effective as a preventative tool, not a rescue treatment and should not be tank-mixed with antibiotics.
- **Regalia Maxx** (extract of *Reynoutria sachalinensis*) – a plant extract that induces systemic resistance. Regalia can reduce disease severity under some conditions, but research shows variable performance, especially under high fire blight pressure. It is best used early, preventively, and in rotation rather than a stand-alone tool.

Overall, SARs should be viewed as **complements**, not replacements for antibiotics and growth regulators in fire blight management programs.



Not All Blocks Are Equal

In fire blight studies, not all cultivars respond the same way to management tools. Across multiple states, trials showed that cultivars like Gala and Pink Lady tended to show the greatest reduction in shoot blight with prohexadione-calcium and SAR programs. Fuji and Honeycrisp generally had lower shoot blight severity overall, reflecting lower inherent susceptibility to systemic infections (i.e., more resistant cultivars).

Tree vigour played an equally important role. Highly vigorous trees, particularly in young, high density systems were more likely to develop severe shoot blight and rootstock infections. In these blocks, prohexadione-calcium was consistently one of the most effective tools, as it slows shoot elongation and reduces the amount of highly susceptible tissue.

In contrast, SARs alone were often insufficient in very vigorous plantings unless disease pressure was low to moderate and applications were made early.

Environment Drives Efficacy

Antibiotic alternatives, such as biological and biorational products showed highly variable performance during multi-state trials, and the environment was a major driver:

- **Wind speed** – often improved product performance
- **Humidity** – increased efficacy for some biologicals
- **Solar radiation** – influenced drying conditions of certain products
- **Infection risk level** – high disease pressure reduced control

For example, products like Blossom Protect (Figure 3) performed better under moderate risk and higher wind speeds. Serenade (Figure 4) and essential oil products (e.g., Thyme, Cinnamon) worked best when humidity and drying conditions were favourable. However, under high disease pressure, no biological product matched the efficacy of antibiotics.

Biological products need to be selected and timed carefully, based on weather conditions and infection risk rather than used as a stand-alone replacement for antibiotics during high infection risk periods.

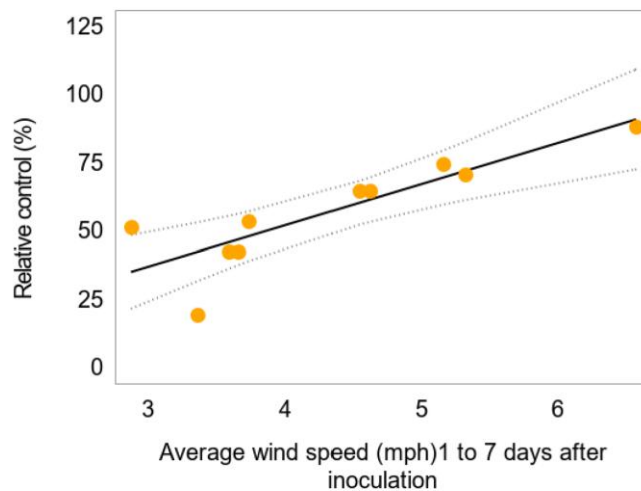


Figure 3. Relationship between the relative control of blossom blight with Blossom Protect to wind speed over 7 days from infection in Gala apple. (DuPont et al. 2024)

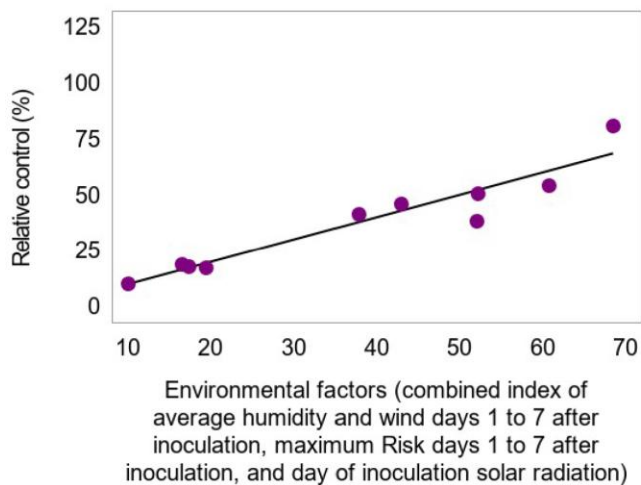


Figure 4. Relationship between relative control of blossom blight with Serenade to humidity and solar radiation within 7 days of infection in Gala apples. (DuPont et al. 2024)

Pruning – Most Powerful Tool

Timely removal of infected tissue remains essential for reducing spread of fire blight and preventing tree loss. Ten field trials across multiple states evaluated different pruning strategies, including:

1. **Best management practice (BMP)** – cut 30-45 cm (12-18 in) below visible symptoms, in 2- or 3-yr wood.
2. **Aggressive cutting** – cut 60-75 cm (2-2.5 ft) below visible symptoms.



3. **BMP without tool sanitation**

4. **Ugly stub cuts** – leave a 10-12 cm (4-5 in) stub at trunk
5. **Flush cuts** – cut flush to trunk
6. **Breaking** – break at the joint between 1- and 2-year wood by hand
7. **No removal (control)**

The results reinforce long-standing recommendations – with some important clarifications.

Best management practice still works! Removing infected shoots 30-45 cm (12-18 in) below visible symptoms **consistently reduced tree death and new symptom development**. More aggressive cutting (60-75 cm, or 2-2.5 ft) generally did not improve outcomes and removed more productive wood.

Breaking shoots by hand was fast but often left more cankers behind and increased inoculum for the following year.

In situations where a conservative cut beyond visible symptoms can't be made, leaving an ugly stub of 10-12 cm (4-5 in) can help protect structural wood in some situations (Figure 5). This allows small cankers to form at the end of the stub which can be removed during winter pruning. Cutting an infected branch flush to the trunk increased the likelihood of canker development into the structural wood itself (Figure 6).

Importantly, sanitizing tools during summer pruning did not significantly reduce re-infection when cuts were made far enough below symptoms. In high pressure



Figure 5. An ugly stub pruning cut leaves a 10-12 cm (4-5 in) stub at the trunk to allow a small fire blight canker to form. This canker can be removed during winter pruning. (Photo: T. DuPont, Washington State University)

situations, **speed of removal may be more important than tool sanitation**. Where there is the labour and time to sanitize between cuts, this classic recommendation remains. However, particularly for larger affected areas, young and/or vigorous trees, or during times of high risk of spread, the limiting factor is how quickly you get through a block – assuming you are making appropriate cuts far enough back from the infected area.

When it comes to young trees (1-3 years old), management is a different story. Fire blight can move so quickly that pruning is often ineffective. In these cases, **remove and destroy infected trees promptly**. Focus on protecting adjacent trees using an integrated approach, including vigour management, careful monitoring, and preventive use of SARs, copper or other antibiotic-alternatives to reduce the risk of secondary infections.

Adapting Strategies

One of the biggest themes from this research is that fire blight management requires a season-long integrated approach:

- Use **risk models** to time blossom protection, such as the [Ontario Fire Blight Prediction Maps](#).
- Combine **antibiotics, biologicals, SARs and growth regulators** strategically, based on weather and infection risk. Products registered for fire blight management and their relative efficacies can be found on the [Ontario Crop Protection Hub](#).
- **Manage tree vigour**, where possible.
- **Act quickly** to remove infections during the season.



Figure 6. A flush cut of an infected branch against the trunk can result in fire blight canker development directly into the structural wood. (Photo: T. DuPont, Washington State University)



- Focus on **preventing shoot blight**, not just reacting to it. Continue to monitor weather and infection risk beyond just bloom time and keep insect feeding damage to a minimum.

Even good programs can sometimes lose to fire blight.

- Under extreme risk (hot, humid and wet), protection can be overwhelmed and certain products such as biologicals can have reduced reliability.
- Unsettled weather events such as strong winds, heavy rain, and hail can introduce bacteria into a block from surrounding areas.
- Susceptible cultivars and rootstocks show more rapid spread, causing a small infection to quickly accelerate into a much larger issue.
- When shoots are rapidly growing, the growth rate itself and the microscopic wounds of the expanding leaves can outstrip what defense priming or protectants can provide. Another reason prohexadione-calcium can help post-bloom.

Anticipate. Regulate. Remove.

Fire blight wins when it gets a head start.

The best programs don't chase it – they stay ahead through prevention, vigour management, and fast response.

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