CROP PROTECTION

Blight Insight, Part 1
Common Questions and Key Management Considerations

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Few diseases generate more questions from apple growers than fire blight. From infection warnings and timing blossom sprays to managing strikes, 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. Let's look at a few of the most common fire blight questions and the science behind best management practices. Stay tuned to the next ONcore issue for Part 2: Pruning & Removal, Orchard Factors, and Modelling.

Biology & Infection

How does fire blight spread?

Fire blight is caused by the bacteria, *Erwinia amylovora*, which survives in cankers and infected tissue. In the spring, bacteria multiply and produce a sticky ooze that serves as a source of inoculum. Bactera can be spread by rain splash, strong winds, insects, contaminated equipment and movement from infected tissue within the tree or orchard.

However, the movement of bacteria does not always result in infection. To cause disease, bacteria must reach a susceptible entry point – such as an open blossom, actively growing shoot, or fresh wound – and environmental conditions must be favourable for infection. During bloom, bacteria multiply on flower surfaces and enter through natural openings in the nectaries. Later in the season, bacteria can also enter shoots, trunk or root suckers through wounds caused by hail, wind damage, or insect feeding.

Does fire blight need rain to infect?

Not always. For blossom infections, bacteria require moisture to move from the flower surface into the nectaries, but that moisture can come from rain, heavy dew, fog, or even spraying. If you look at the requirements for blossom blight infection based on the Maryblyt model, a wetting event is >0.01" (0.25 mm) rain, heavy dew or fog sufficient to wet foliage and provide thin film on tissue surface or rain of >0.1" (2.5 mm) the previous day.

Why is fire blight worse in some years than others?

Fire blight severity is driven largely by weather during bloom. Warm temperatures above 18˚C accelerate bacterial growth on flower surfaces, while rain, dew, or high humidity (>90%) facilitate infection. Extended bloom periods can increase the number of susceptible flowers exposed to infection events. Tree vigour, cultivar susceptibility, inoculum carryover from previous years, and trauma events such as hail can further increase disease pressure. Years with warm, wet bloom conditions often produce the most severe outbreaks.

The model is still not indicating risk – why?

Fire blight models do not simply respond to open bloom and rainfall. Before infection can occur, bacteria must first build to sufficient populations on flower surfaces. This process is largely driven by temperature. During cool weather, bacteria growth is slow, and populations may not reach the threshold required for infection. Most forecasting models, therefore, require a combination of open bloom, adequate heat accumulation, and moisture before infection risk increases.

What weather conditions create the greatest infection risk?

The highest risk occurs when susceptible blossoms are present during periods of warm temperatures and moisture. Temperatures above approximately 18–20˚C promote rapid bacterial multiplication on flower or leaf surfaces, while rain, dew, or high humidity provide the moisture needed for infection. Extended periods of warm, wet weather create ideal conditions for epidemic development.

While moisture is required for infection, temperature is the driving factor. A wetting event during cool weather may result in little or no risk, whereas the same wetting event following several days of warm temperatures can trigger a significant infection period.

Blossom Blight Management

When does blossom blight risk end?

Blossoms become less susceptible to fire blight as they age and the calyx begins to close. Once petal fall is complete, blossom blight risk ends. Staggered or delayed (rat-tail) bloom will extend the risk until the last blossom falls. We have seen situations where these late blossoms can lead to unexpected and severe fire blight outbreaks.

If time and labour are available, it may be best to go through the orchard every couple of days and remove the rat-tail blossom by hand. Be sure to remove blossoms in dry weather to present spread of infection. For many, this practice is just not viable. Instead, continue to monitor infection risk and apply protectants if needed.

Are frost-damaged blossoms still at risk of infection?

Yes, frost-injured blooms can still be at risk of infection. Damage to the pistil and ovary does not likely have an effect on entry of the bacteria into the flower as bacteria are washed into the nectaries, or flower cups not the reproductive organs. As well, frost can cause wounding and damage to the base of the petals or tender wood surrounding blooms. This wounding creates another point of entry for the fire blight pathogen should bacterial cells be transferred to this surface.

How long is a blossom protected after an antibiotic spray?

Antibiotics, such as Streptomycin and Kasumin provide protection to blossoms present at the time of application, but does not protect flowers that open afterward. Under most conditions, protection is considered effective for approximately 2-3 days. Heavy rainfall, rapid bloom progression, and high UV can shorten the activity period. For this reason, frequent application may be needed and should be based on bloom conditions rather than calendar timing.

An infection event just happened – is there anything I can do?

In general, fire blight products are most effective when applied before an infection event. Protecting blossoms before rain, dew, or other wetting events helps prevent bacteria from entering susceptible tissue. Once in the plant, growth can be exponential and move quickly through shoots (upwards of 10 cm per day!).

However, some products have limited post-infection, or kickback activity if a potential infection event is missed. Streptomycin may suppress infection if applied within 24 hours after an event, ideally within 4 to 12 hours. Kasumin does not have the same kickback activity.

Copper, such as Cueva works differently. While it does not provide kickback activity for any bacteria that may have entered the tissue, copper can be used after an infection event to suppress bacterial populations on plant surfaces and limit further infection. Similar to Streptomycin, apply as soon as possible after an event.

Is Streptomycin still effective in Ontario?

Streptomycin remains an important and effective tool for managing fire blight in Ontario. However, resistance has been documented in some orchards in the province. While resistance is not widespread, its presence highlights the importance of resistance management and avoiding unnecessary applications.

Kasumin is an effective rotation partner and provides control of Streptomycin-resistant isolates. Rotating products with different modes of action can help reduce the risk of resistance development.

Can I mix antibiotic sprays with fungicides or nutrients?

Compatibility depends on the specific products involved. While many tank mixes are physically compatible, certain combinations may reduce efficacy or increase the risk of phytotoxicity. For example, Streptomycin cautions against mixing with calcium while Kasumin may cause injury when mixed with boron. Caution is also needed with some biological products containing living microorganisms, such as *Bacillus* or yeast species as antibiotics may kill or suppress the beneficial bacteria.

Always consult current labels and compatibility information before tank mixing. When infection risk is

high, ensuring antibiotic efficacy should take priority over spray convenience.

Are biological fungicides as effective as antibiotics against fire blight?

When risk is low to moderate, especially in orchards with past fire blight pressure, consider:

- **Biologicals** – eg., Blossom Protect, Buran, Serifel, Serenade, Cyclone Plus, Regalia, or Double Nickel
- **Surface sterilant** – eg., Oxidate
- **Copper labelled for in-season use** – eg., Cueva – note that copper and some fungicides are not compatible with certain biologicals. Check the label before use.

The early timing for biological products is important for a number of reasons.

- Firstly, because most of these products work by competitive exclusion, inhibiting growth or triggering a defense mechanism in the plant, they need time to colonize and become established. A good approach to timing for biologicals is when risk is coming in the next 3-4 days.
- Many of these products provide only limited control under high pressure or during certain environmental conditions.
- Using these suppression products when there are few blooms and risk is lower, allows you to save your uses of antibiotics like Streptomycin and Kasumin for peak bloom (50-80% bloom) and high infection risk events.

Is Apogee/Kudos a substitute for blossom sprays?

No. Apogee and Kudos reduce shoot susceptibility by suppressing vegetative growth and altering cell walls, but they do not protect blossoms from infection. Blossom protection products such as antibiotics or biologicals are required when infection conditions occur during bloom. Apogee and Kudos are best viewed as complementary tools that help reduce shoot blight risk later in the season rather than replacements for blossom blight management.

Shoot Blight & Summer Management

Why am I getting shoot blight when I sprayed during bloom?

Shoot blight can develop independently of blossom blight. Once bacteria become established in an orchard, they can spread to rapidly growing shoots through natural openings in leaves, wounds, or insect feeding sites. Young succulent shoots are highly susceptible because actively growing tissues provide favourable conditions for bacterial multiplication and movement. Warm temperatures, vigorous growth, and storm events can all increase shoot blight risk during summer.

Does hail increase fire blight risk?

Yes. Hail creates numerous wounds that can serve as entry points for *E. amylovora* to get into the tree. If inoculum is present in the orchard, bacteria can rapidly colonize injured tissues, resulting in trauma blight. The highest risk occurs when hail coincides with warm temperatures and active bacterial populations. Rapid response following hail events is often critical in orchards with a history of fire blight.

Can insects spread fire blight?

Yes. Pollinating insects such as bees and flies can move bacteria between blossoms, contributing to spread during bloom. Other insects such as leafhoppers or aphids may carry bacterial cells on their bodies or create wounds that facilitate infection, particularly shoot blight. However, insects are generally considered secondary contributors compared with weather-driven spread through rain splash, wind-driven rain, and bacterial ooze movement.

When should I apply Apogee/Kudos?

Prohexadione-calcium products such as Apogee and Kudos should be applied early enough to slow shoot growth before periods of high fire blight risk. These products reduce shoot susceptibility by reducing terminal growth and strengthening cell walls. However, they require approximately 10–14 days for full response. Begin applications at king bloom petal fall (typically when growth is 2.2 – 5.5 cm long). Follow-up applications may be needed until terminal set depending on growth rate and disease pressure.