Managing Fire Blight in 2021

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2020 fire blight season recap. In 2020, there were devastating fire blight outbreaks in NY and much of New England. The season was characterized by hot dry weather from the end of bloom into petal fall, which were the perfect conditions for systemic shoot blight. In the second half of May many sites experienced extreme risk for fire blight when bloom was apparently over and rainfall, dew, and humidity were scarce. Many growers were mystified with the subsequent outbreaks of shoot blight and perplexed as to how blossom infections could occur with the lack of moisture during high-risk periods. This is a common occurrence in the pacific northwest where fire blight devastates apple production despite a dry climate. Indeed, it may take only the slightest bit of internal canopy humidity or water from a nutritional or fungicide application to start an epidemic in exceptionally warm weather. We should remain cautious with vigorous growth during warm weather in the 2021 season, particularly as we approach petal fall and as shoots elongate.

Present season. Currently, orchards in the Hudson Valley are beginning to bloom, and temperatures will be approaching the high 60s/low 70s throughout the state this week. In Western NY, king bloom could occur this week for many varieties, and there is more warm weather in high 60s/low 70s in the long-term forecast. Despite the potential for a warm bloom, weather can change suddenly, and it will be important to watch weather forecasts and follow extension specialists' alerts and fire blight risk predictions. Even with the upcoming warm weather, it may not warrant an antibiotic application unless the temperatures rise above 70F and you are in the Hudson Valley with considerable. If you are concerned with carry over inoculum from fire blight last season, consider the prohexadione-calcium at pink to slow the migration of bacteria through tissues as the plants grow.

Forecasting Infection Events. Keep track of first blossom open dates for each of your varieties, especially those that are susceptible to fire blight. Make a note on a piece of paper or in notes on your phone. Use these dates to run the NEWA fire blight model to increase precision. If you have access to precise information, avoid using the model default dates or generalized, region-wide dates.

As you consider disease forecasting outputs from NEWA or other forecasting models, here are some things to consider before making applications of antibiotics or other costly materials for managing blossom blight:

1. **Predictions and forecasts are theoretical.** The theoretical models predicting disease risk use weather data collected (or forecasted) from the weather station location. These results should not be substituted for actual observations of plant growth stage and disease occurrence determined through scouting or monitoring.
2. **Consider the history of fire blight in the planting**. If there was no fire blight the previous season or if you have never had fire blight do not let excessive model predictions or extension alerts (including this article) "intimidate you" into applying unnecessary antibiotics each time an alert is released.
3. **Consider the age and susceptibility of your trees**. Age and variety can play a large role in the development of fire blight. Presently, none of the models consider these factors in a formal sense. Adjust your interpretations of model predictions based on tree age, variety, and rootstock. If you have a young planting of a highly susceptible variety, it may be more important to protect these blocks based on model predictions than a 15-year-old 'McIntosh' planting on resistant rootstocks, which may not warrant the same level of protection during bloom and you no longer have a market for. A listing of susceptible cultivars and rootstocks is linked from the NEWA model page for fire blight.
4. **The models only identify risk of infection based on weather conditions**. This includes temperature and moisture conditions. All wetting events are now color-coded light blue in NEWA to draw attention to the weather factors that promote bacterial ingress into the flowers. Despite the use of words like "extreme" and "infection" colored in vibrant red, the models only predict infections based on favorable weather conditions. If the apple variety is not highly susceptible, if there is no prior history of fire blight, and if the trees aren't being pushed into high vigor with nitrogen, the actual risk of fire blight infection may be low to non-existent.
5. **Weather forecasts and predictions can change frequently**. Model predictions are based on weather predictions, so when forecasts change, the model predictions and corresponding risk will also change

drastically. Bacteria double about once every 20 minutes under optimal conditions; for fire blight this is warm weather >60F. The models use hourly weather data, rather than daily summaries, to accommodate the rapid growth rate of these pathogens. Check the fire blight predictions, especially those in the forecasts, frequently. The 1- and 2-day forecasts are the most reliable; those at 3-, 4- and 5-days are less accurate predictors. NEWA uses the National Weather Service forecasts which you can compare to your favorite local weather forecast provider.

We have continued to refine and update our guidelines for managing fire blight in NY with an emphasis on young plantings. The guidelines below are broken up into three sections: general guidelines for season-long management, additional guidelines for new plantings, and guidelines for on-farm nursery production:

Ten general guidelines for season-long management of fire blight in apples.

1. All fire blight strikes and shoots with larger cankers should be removed during winter pruning. Remove any trees where the central leader or main trunk has become infected. Infected wood should be removed from the orchard and either burned or placed where it will dry out rapidly. The fire blight pathogen can withstand cold temperatures but is intolerant to drying.
2. Copper sprays should be applied at green tip. Processing varieties can be protected with copper as late as ½ inch green depending on requirements of the label.
3. At late 'Tight Cluster' or 'Early Pink', preventative applications of prohexadione-calcium (Apogee or Kudos) for blossom blight and early shoot blight may be helpful, especially on highly vigorous plantings of highly susceptible apple varieties. If you have a low vigor block, these programs may not provide benefit as the trees need to be actively growing for the plant growth regulator to work. Also, consider applying PhCa during warmer temperature above 65F to improve absorption and metabolism of this PGR. In all, this use practice should not be a substitute for a robust blossom blight program (see 5).
    a. An application of prohexadione-calcium at pink at 6 oz/100 gal may reduce blossom blight and subsequent shoot blight in high vigor blocks.
    b. Applications of prohexadione-calcium of 2 oz/100 gal mixed with 1oz /100 acibenzolar S-methyl at both 'Pink' and 'Petal Fall' may similarly be effective
4. During bloom, follow a blossom blight forecasting system such as the ones offered in NEWA (newa.cornell.edu/index.php?page=apple-diseases). Time applications during high risk weather only. If the operation rarely or has never had fire blight, it may not be necessary to apply antibiotic each time a high-risk period is forecast. Regardless of model predictions, it is rarely necessary to make more than three applications for blossom blight.
5. **Operations with No Recent History (> 3 Seasons) of Streptomycin Resistance**.
    a. At 'Bloom' begin antibiotic applications for blossom blight with a single application of streptomycin at 24 oz/acre. Consider including the penetrating surfactant Regulaid (1 pt/100 gal of application volume) in the first streptomycin spray to enhance the effectiveness of streptomycin. Regulaid would be especially beneficial when applied under rapid drying conditions. Regulaid can be omitted from subsequent applications to minimize the leaf yellowing that is sometimes associated with repeated applications of streptomycin.
    b. If later antibiotic applications are needed, streptomycin or kasugamycin (Kasumin 2L 64 fl oz/A in 100 gallons of water) should be used. Consider making at least one application of Kasumin 2L for resistance management purposes. If there are concerns about the effectiveness of streptomycin or kasugamycin, contact one of the people listed on the last page to discuss the product failure and determine if it would be necessary to submit a sample for antibiotic resistance testing. The presence of shoot blight later in the season isn't necessarily an indication that antibiotics applied during bloom failed due to resistance.

5. **Operations with Streptomycin Resistance**.
    a. At 'Bloom' begin antibiotic applications for blossom blight with a single application of kasugamycin (Kasumin 2L) at 64 fl oz/A in 100 gallons of water. Consider including the penetrating surfactant Regulaid (1 pt/100 gal of application volume) to enhance the effectiveness of kasugamycin. Regulaid would be especially beneficial when applied under rapid drying conditions. Do not use alternate row middle spraying and apply after petal fall. (The PHI is 90 days and REI is 12 hours).
    b. If a later antibiotic application is needed, Blossom Protect (1.25 lbs/A + 8.75 Buffer Protect; OMRI listed) or Oxytextracycline at the highest rate should be used.
    c. If three application are needed, consider using Kasumin 2Lfor the first and last application. Use Blossom Protect during bloom and avoid using it as trees go into petal fall.
6. In the two weeks following bloom scout for, and prune out, fire blight strikes promptly. Destroy pruned strikes by burning or leaving them out to dry. It is best to prune well back into healthy wood, at least 12 inches behind the water-soaked margin. Take care as summer pruning may stimulate active shoot growth leading to new susceptible tissues that could later become infected. If fire blight reaches the central leader, the tree should be removed. However, the spot may be safely replanted.
7. Preventative applications of prohexadione-calcium (Apogee or Kudos) for shoot blight should be seriously considered, especially on vigorous blocks of highly-susceptible apple varieties during shoot elongation which begins in late bloom.
    a. For maximum effectiveness, prohexadione-calcium should be applied at 6-12 oz/100 gal (3-6 oz/100 gal for tree <5 years) when trees have 1-2" of shoot growth. A second application should be made 14-21 days later.
8. Preventative applications of copper can be used post-bloom and during the summer to protect against shoot blight infections. Copper must be applied before infection occurs as it will only reduce bacteria on the surface of tissues. It will have no effect on existing shoot blight infections and may cause fruit russet in young developing fruit. Apply with adequate drying time and use hydrated lime to safen copper. Terminal shoots can outgrow protective residues of copper. A low rate fixed copper program consists of applications on a 7-10 day schedule during high risk weather until terminal bud set.
9. It may be possible to save plantings on resistant rootstocks that have a moderate amount of shoot blight. Apply prohexadione-calcium at the highest rate for the planting (6-12 oz/100 gal) and allow 5 days for the product to take effect. Afterwards, prune out existing and newly developing shoot blight every two weeks for the rest of the season and remove any trees where fire blight has reached the central leader. If pruning stimulates additional shoot growth, a second application of prohexadione-calcium could be warranted.
10. If you need to interplant apple trees in existing orchards where trees were killed by fire blight and removed, replant these missing trees 'skips' in late fall to synchronize next season's bloom with established trees.

Eight additional guidelines <u>for new plantings</u> (1-2 years)

1. If possible, plant varieties grafted on fire blight-resistant rootstocks.
2. Trees should be carefully examined for fire blight infections before planting. Infected trees should be submitted for strep-resistance testing and subsequently discarded. Contact anyone listed on the last page under "Sample Submission" for SR Ea testing.
3. Immediately after planting, and 14 days later, a copper application should be made using the lower copper rates labeled for use after green tip. Ensure that soil has settled to avoid phytotoxicity to roots.

4. Trees should be scouted at 7-day intervals for fire blight strikes until July 31st. Infected trees should be removed as described above. Plantings also need to be scouted 7-10 days after hail or severe summer storms. The NEWA fire blight disease forecast tool (newa.cornell.edu/index.php?page=apple-diseases) can assist by providing an estimate of symptom emergence following a storm or other trauma event. You should also scout the planting at the end of the season (mid-September).
5. If possible, remove flowers before they open. New plantings may have considerable numbers of flowers the first year, and blossom removal may not be practical. If done, remove the blossoms during dry weather and before a lot of heat units have accumulated, because both factors contribute to higher risk of fire blight infections.
6. Trees should receive an application of copper at a stage equivalent to bloom. Observe the labeled REI before blossom removal.
7. To protect any remaining blooms, follow the chemical management program above. Both pink programs of prohexadione calcium have been used on young plantings with no compromise to establishment by the late fall. However, program involving applications of prohexadione-calcium at 2 oz/100 gal mixed with 1oz /100 acibenzolar S-methyl at both 'Pink' and 'Petal Fall' has been tested both NY and MI and involves lower rates of PhCa.
8. Samples of any infections observed after planting should be submitted for strep-resistance testing – contact anyone listed on the last page. Infected trees should be removed entirely in high density orchards.

Eleven guidelines for on-farm nursery production

1. Collect budwood from orchards where fire blight is not established or from a neighboring farm without fire blight.
2. Limit streptomycin and kasugamycin applications to 2-3 per season. These should be timed according to a disease forecast prediction or CCE alert.
3. When fire blight pressure is high and shoots are actively growing, apply copper at the lowest labeled rate to prevent shoot blight.
4. Before conducting tree management tasks in the nursery, apply a copper product at the lowest labeled rate and observe the labeled REI.
5. Any pinching or leaf twisting, should be done on dry sunny days with low relative humidity, after the REI of a copper application has expired.
6. When working in the nursery, field workers must wear clean clothing, and should wash hands and disinfect working tools often.
7. If fire blight is found in the nursery, completely remove the infected trees including the root systems, and place them in trash bags between rows. Subsequently, remove the culled trees from between the rows and discard them. Under no circumstances should unbagged infected trees be pulled between nursery rows when trees are wet, otherwise fire blight will be spread down the rows.
8. Manage potato leafhoppers in the nursery using a registered product.
9. Maintain weed control through cultivation. Apply registered post-emergence herbicides using a shielded boom. There are some residual herbicides registered for use in nurseries.
10. When trees have reached the desired height, consider applying the lowest labeled rate of Apogee (1-2 oz/100 gal) to slow growth and reduce shoot blight susceptibility.
11. Manage nitrogen levels to balance tree growth and fire blight susceptibility.