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Managing Fire Blight in 2022

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2021 fire blight season recap. In 2021, there were devastating fire blight outbreaks in NY and New England, especially in regions with later bloom at the end of May. The season was characterized by cool "low risk" bloom that seemed to linger and exceptionally hot, stormy "high-risk" weather from the end of bloom into petal fall. These were perfect conditions that resulted in systemic shoot blight infections. Many growers using strong antibacterial programs to the end of bloom were easily able to manage fire blight while others experienced outbreaks of shoot blight during storms at or shortly after petal fall. Only Long Island and the Hudson Valley were able to escape these late bloom infections. With the cool spring we are now experiencing, we should remain cautious even if it remains cool during bloom and prepare for higher risk periods of erratic heat at petal fall or shortly after during thinning. Growers need to be prepared to finish the susceptible period (through petal fall) strong with their most effective options, particularly when petal fall approaches and as shoots elongate.

Present season. Currently, orchards in the Hudson Valley are beginning to approach bloom. In the Champlain Valley, king bloom is a few weeks away, but more warm weather in the 60s and 70s is in the long-term forecast. Despite the potential for a moderate bloom, weather can change suddenly and it will be important to watch weather forecasts and follow extension specialists' alerts and fire blight risk predictions. If you are concerned with carryover inoculum from fire blight last season, consider applying prohexadione-calcium (Kudos, Apogee, etc.) at pink to slow the migration of bacteria through tissues as the trees grow.

Forecasting Infection Events. Keep track of first blossom open dates for each of your varieties, especially those susceptible to fire blight. Make a note on a piece of paper or in note applications on your phone. Make sure to use these dates in the NEWA fire blight models to increase precision (https://newa.cornell.edu/fire-blight). Avoid using the less-accurate model default dates or generalized, region-wide dates if you have access to precise bloom information.

As you consider disease forecasting outputs from NEWA or other forecasting models, here are some

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things to consider before making costly applications of antibiotics or other 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 temperatures above 60° F. The models use hourly weather data, rather than daily summaries, to accommodate the rapid growth rate of these pathogens. Check the fire blight predictions frequently, especially those in the forecasts. 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 and what you see happening in the area.

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 production of nursery trees:

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 growth regulator (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 benefits as the trees need to be actively growing for the plant growth regulator to work. Also, consider applying prohexadione-calcium during warmer temperatures above 65F to improve absorption and metabolism. In all, this practice should not be a substitute for a robust blossom blight program (see 5).

    a. An application of prohexadione-calcium (Kudos, Apogee, etc.) at pink at 6 oz/100 gal may reduce blossom blight and subsequent shoot blight in high vigor blocks.

    b. Applications of prohexadione-calcium (Kudos, Apogee, etc.) of 2 oz/100 gal mixed with 1oz /100 acibenzolar S-methyl (Actigard) 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 (https://newa.cornell.edu/fire-blight). 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. **A: Operations with No Recent History (> 3 Seasons) of Streptomycin Resistance**.

    a. Before high-risk ('Extreme' or 'Infection') weather 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 its effectiveness. 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 Dan Donahue or Mike Basedow to discuss the product failure and determine if it would be necessary to submit a sample for antibiotic resistance testing (https://blogs.cornell.edu/coxlab/disease-sample-submission-forms/). The presence of shoot blight later in the season isn't necessarily an indication that antibiotics applied during bloom failed due to resistance.

B: Operations with Streptomycin Resistance.

a. Before high-risk ('Extreme' or 'Infection') weather 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. It's entirely possible to have an effective program consisting of only Blossom Protect. This is the best option for organic production systems.

c. If three applications are needed, consider using Kasumin 2L for 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 location 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 during late bloom.

a. For maximum effectiveness, prohexadione-calcium (Kudos, Apogee, etc.) 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. Remember 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 (Kudos, Apogee, etc.) 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, but 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 tree 'skips' in late fall to better synchronize next season's bloom with established trees.

Eight additional guidelines for new plantings (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. Please check our blog for the latest sample submission guidelines (https://blogs.cornell.edu/coxlab/disease-sample-submission-forms/).

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 that can create wounds for new infections. The NEWA fire blight disease forecast tool (https://newa.cornell.edu/fire-blight) 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) for fire blight symptoms.

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 attempted, remove the blossoms during dry weather and before a lot of heat units have

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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 bloom, follow the chemical management program above. Both pink programs of prohexadione calcium (Kudos, Apogee, etc.) have been used on young plantings with no compromise to establishment by the late fall. The program consisting of applications of prohexadione -calcium at 2 oz/100 gal mixed with 1oz /100 acibenzolar S-methyl (Actigard) at both 'Pink' and 'Petal Fall' has been effective in both NY and MI and uses lower rates of prohexadione-calcium.
8. Infected trees should be removed entirely in high density orchards. Samples of any infections observed after planting should be submitted for strep-resistance testing. Please check our blog for the latest sample submission guidelines (https://blogs.cornell.edu/coxlab/disease-sample-submission-forms/).

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 disinfest working tools often using 70% alcohol or a Lysol® or Chlorox® sanitation wipe.
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 (reduce excessive vigor and avoid rapid shoot elongation) and fire blight susceptibility.

Petal Fall Pest Management Review

Dr. Art Agnello and Dr. Monique Rivera, Cornell University; Mike Basedow, CCE ENYCHP

While we've still got some time before petal fall, we do want to share a reminder of the key pests we are targeting during this critical timing.

Plum Curculio

Adults move into orchards from overwintering sites in hedgerows or the edges of woods and adults are active when temperatures exceed 60°F. Adult females oviposit in fruit during both day and night but feed mostly at night. Depending on temperature, overwintering adults remain active for 2–6 weeks after petal fall. Because adults are not highly mobile, orchards near overwintering sites, woodlands, and hedgerows are most susceptible to attack. Fruit damage is usually most common in border rows next to sites where adults overwinter. Although initial postbloom sprays for plum curculio control should begin at petal fall, growers are often unsure how many additional sprays will be necessary to maintain protective chemical residues to prevent subsequent damage throughout the PC oviposition cycle, which varies according to temperatures and weather patterns after petal fall. A fact sheet with photos and descriptions of this insect's life stages can be found at: https://hdl.handle.net/1813/43118

Following from the fact that PC activity and oviposition are largely determined by temperature, we are able to use an oviposition model to estimate when control sprays after petal fall are no longer necessary to protect fruit from PC damage. This model is based on the assumption that residues from sprays applied after petal fall need to be maintained on fruit and foliage only until PC adults stop immigrating into orchards, which happens to correspond to the time when about 40% of the oviposition cycle is complete. The model predicts this to occur at 308 DD (base 50°F) after petal fall of McIntosh. This strategy most likely works because, after 40% of PC oviposition is complete, adults usually do not move into the orchard from outside sources, or within orchards from tree to tree. Therefore, by this time, adults residing in treated trees have already been killed by insecticide residues and are unable to complete the remainder of their normal oviposition cycle.

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Understanding an orchard's historical damage is important for the management of plum curculio. If there has been significant damage in the previous years, it is helpful to pinpoint the hotspots of damage within the orchard and to place pyramid traps at the end of where hotspots occur. This can help early detection and confirmation of their movement into the orchard.

Pyramid traps can be used to monitor PC migration into known hotspots within the orchard. Image: AgBio.

In order to use this strategy: (1) Treat the entire orchard at petal fall with an effective insecticide (e.g., Imidan, Actara, Avaunt, Verdepryn). (2) Start calculating the accumulation of DD after petal fall of Macs (base 50°F); this is easily done from the NEWA Apple Insect Models page (https://newa.cornell.edu/crop-and-pest-management) by entering the petal fall date for your area. (3) No additional sprays are necessary whenever the date of accumulation of 308 DD falls within 10–14 days after a previous spray.

In cherries and other stone fruits that are already at shuck fall, sprays should start (or should have started, as appropriate) at the first opportunity.

Recall that, in addition to the industry standard broad-spectrum materials such as Imidan, some additional options may be considered: Avaunt and Actara are effective for plum curculio in apples and pears, and Avaunt is also labeled in stone fruit as another PC option. Delegate, Assail, and Altacor all have some activity on PC, but should not be considered as the first choices in high-pressure blocks. Another option would be Exirel, a 2nd-generation diamide with better efficacy against this pest.

European Apple Sawfly

This primitive bee and wasp relative prefers early or long-blooming varieties with a heavy set of fruit. While it has historically been more of an issue for eastern New York, it has been gradually becoming more problematic in the western counties, and now frequently reaches as far as Wayne Co. (and beyond). The adult sawfly emerges around bloom and lays eggs in the apple blossoms. Young larvae begin feeding just below the skin of the fruits, creating a spiral path usually around the calyx end. This early larval feeding will persist as a scar that is very visible at harvest, and which some have described as decorative looking, although fruit marketability is obviously affected. The larva usually begins tunneling toward the seed cavity of the fruit or an adjacent fruit, which usually causes it to abort. As the larva feeds internally, it enlarges its exit hole, which is made highly conspicuous by a mass of wet, reddish-brown frass. The frass may drip onto adjacent fruits and leaves, giving them an unsightly appearance. The secondary feeding activity of a single sawfly larva can injure all the fruit in a cluster, causing stress on that fruit to abort during the traditional "June drop" period. A fact sheet with photos and descriptions of this insect's life stages can be found at: https://hdl.handle.net/1813/43091

European apple sawfly damage is characterized by its russetted, spiraled scars. Image: OMAFRA.

Certain insecticides that control this pest also adversely affect bees, which can pose a problem at petal fall because certain apple varieties lose their petals before others. In blocks of trees where petal fall has occurred on one variety but not the others, the variety that has lost its petals is likely to sustain some curculio or sawfly injury until an insecticide is applied. Some insecticides with activity against both plum curculio and sawfly — like Avaunt and Actara — may have an advantage over the conventional OP Imidan in this case. Assail represents another option for controlling sawfly; it's not very active against plum curculio, but will do a good job against rosy apple aphid (and spotted tentiform leafminer, if those still can be found in your orchard), as well as sawfly, at this timing. Altacor and Exirel are both rated high in their control efficacy against sawfly. To minimize the hazard to honey bees, make sure any pesticide is applied only when no bees are actively foraging on blooming weeds (evening is better than early morning).

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Obliquebanded Leafroller (OBLR)

As your looking through your buds this time of year, it would be prudent to have a quick look for later-stage larvae in problem blocks to determine whether a treatment against the overwintered brood should be included in your petal fall plans. Scout the blossom clusters or foliar terminals for larvae feeding within both the flowers and rolled leaves; a 3% infestation rate could justify an application to minimize overwintered fruit damage and help reduce summer populations; there's a sequential sampling chart to facilitate this process on p. 73 of the 2022 Guidelines). A fact sheet with photos and descriptions of this insect's life stages can be found at: https://hdl.handle.net/1813/43111

Damage caused by overwintering OBLR larvae around the petal fall timing. Image: NYSIPM.

Among the selective insecticides available, Intrepid and Rimon have been successful at this timing, and B.t. products, which can be used while blossoms are still present, include Agree, Biobit, Deliver, Dipel, and Javelin. Additionally, Proclaim has been shown to be very effective at the petal fall timing, and also provides activity against early season mite populations. Delegate, Altacor, Exirel, and Verdepryn all offer very good efficacy against not only OBLR, but also the internal leps. Grandevo is a newer biological that is also effective against this broad group of leps. Pyrethroids such as Asana, Baythroid, Danitol, Warrior II, Proaxis or Leverage may also be effective, depending on past use history, but be aware of their broad -spectrum effects, which can work both for and against you, according to your approach towards conserving beneficial mites and insects. Mating disruption is an option for larger, continuous (10+ acres) blocks. If interested, a newer to market option is to combine mating disruption for OBLR and OFM. While it may take a couple years to depend solely on mating disruption, it is another option for control.

Oriental Fruit Moth (OFM)

Use the NEWA Apple Insect Models page to chart current degree day (base 45°F) progress towards the recommended totals of 170 DD (in peaches) and 350 DD (in apples) as the timing at which to apply a protective spray. To maximize the efficacy of 1st brood control, peach growers should use one of the suggested options from the Guidelines starting at petal fall, backed up 10–14 days later. In apples, in addition to Delegate, Altacor, Exirel, and Verdepryn, a number of the petal fall selection of insecticides will do an acceptable job of controlling this generation, including Imidan, the pyrethroids, Intrepid, Assail, and Avaunt. A fact sheet with photos and descriptions of this insect's life stages can be found at: https://hdl.handle.net/1813/43112

European Red Mite

Where prebloom conditions were so difficult for allowing applications of oil or even ovicides, it would be prudent at petal fall to have a look at your rapidly expanding terminal shoots for evidence of hungry motile mites, and consider an early "summer" application of a suitable material to head off problems before they get out ahead of you; it's suitable to use the regular June 2.5/leaf threshold (p. 75 in the Guidelines). There are numerous choices of products available at this time, including the traditionally considered ovicides such as Apollo, Savey and Onager (if not already used this season), as well as Agri-Mek, which can still easily get into the tender leaf tissue to do its work, plus a host of moderate- and quicker-acting maintenance/rescue materials such as Zeal, Kanemite, Nexter, Portal, Acramite, Envidor, Nealta, and Banter. Additionally, if you're planning to apply Proclaim for OBLR, you'll get some miticidal activity too. Be aware of seasonal use limits and IRAC rotational considerations with anything you use now. A fact sheet with photos and descriptions of this pest's life stages can be found at: https://hdl.handle.net/1813/43092

San Jose Scale

Minute SJS adult males emerge in the spring from beneath scale covers on the trees, usually following petal fall, and mate. The females produce live crawlers about 4–6 weeks after mating; these make their way to new sites and insert their mouthparts into the tree, secreting a white waxy covering that eventually darkens to black. SJS infestations on the bark contribute to an overall decline in tree vigor, growth, and productivity. Fruit feeding causes distinct red-purple spots that decrease the cosmetic appeal of the fruit. Insecticidal sprays are most effective when directed against the first generation crawlers, specifically timed for the first and peak crawler activity, which are usually 7–10 days apart.

Monitoring for SJS crawler emergence with double sided black tape around tree limbs. Image: netreefruit.org.

In the Geneva area, first crawler emergence has tended to occur sometime around mid-June. To monitor, place a piece of double sided tape on branches to track initation of crawler movement. If and when a treatment against this stage is needed, Esteem 35WP is one option. It should be applied at 4-5 oz/acre at first crawler emergence; a low rate (0.25% or 1 qt/100) of a highly refined summer oil (see above) has been shown to improve penetration and, therefore, control. Additional products showing control efficacy include Centaur (except Nassau and Suffolk Counties), Movento (most effective when applied at PF-1C, and mix with an organosilicone or nonionic spray adjuvant), Sivanto Prime, and Assail. Other options include Imidan, Admire, or pre-mixes such as Endigo, Leverage, or Besiege. These applications should also be effective against White Prunicola Scale, which has gotten to be increasingly common of in our area, in apples as well as peaches.

Woolly Apple Aphid

This pest has been creeping into more blocks in ENY over the past few years. Options include Diazinon (the best, but a problematic choice for some growers); Movento at PF–1C or whenever infestations are noted, and also, Sefina, Assail and Sivanto.

Integrative Management of Bitter Pit in 'Honeycrisp' Apples from the Extension Perspective

Daniel J. Donahue & Kait McNamee, CCE ENYCHP

Introduction

This article is a summary of essential information from an American Society of Horticultural Science (ASHS) Postharvest Group webinar presented on January 18, 2022. The webinar audience was a mix of research, extension, and commercial industry fruit workers from North America and Europe. As such, it was necessary to introduce the NYS apple industry, the Hudson Valley in particular, the Honeycrisp (HC) apple, and an overview of the 6-years of results from a Honeycrisp bitter pit (BP) research project conducted primarily in the Hudson and Champlain valleys. Because our CCE-ENYCHP Tree Fruit News readers have seen much of this data presented at fruit schools and in previous articles, I'm going to focus on specific recommendations that you can implement for the 2022 growing season. If you would like to review the research in more detail, a list of links to relevant articles will be provided at the end. A recording of the full webinar is available to ASHS members by following this link https://ashs.org/page/ArchivedWebinars .

Bitter Pit and Honeycrisp: General Observations & Recommendations

It's a "bitter" pill to swallow, but after 6 seasons of research in the Hudson Valley, and much more by others in Honeycrisp regions, it's clear that our current level of mitigation technology and understanding of the causal mechanism for BP will not lead to the commercially satisfactory control of bitter pit in Honeycrisp at the levels we expect from our currently available pest management technologies (Figure 1). Our strategy is little different from that of the great coach Vince Lombardi and his "4 yards and a cloud of dust" football playbook. Commercial producers must implement a series of tactics that may not work individually from year to year, but instead these tactics are designed to work as an integrated program to significantly reduce losses overall.

Figure 1. We expect our management technologies to produce clear, consistent results. Unfortunately, this is not the case with bitter pit.

The three most significant BP variables under the control of the commercial producer and marketer are: first, the region where you decide to grow Honeycrisp, second, the rootstock you choose to produce it on and third, how well you manage annual crop load. Cool geographic regions such the Champlain Valley of New York State reliably produce Honeycrisp with fewer instances of BP than warmer regions such as the Hudson Valley of New York State. This realization is of cold comfort to the Hudson Valley producer and marketer, but it is reality. In the future if we continue to move towards an oversupply situation, lower FOB's will inevitably make HC from warmer regions less financially attractive due to BP and color challenges. The second variable, rootstock, is a management choice which is under producer control independent of the growing region. The third variable, crop load, is completely under the control of the orchard manager. We really cannot reduce BP through good crop load management; we can only balance crop load, BP incidence, and fruit quality in such a way to maximize profitability over the economic life of the orchard.

Finally, HC orchard profitability over the long term is essentially a decision matrix in that all your management decisions have consequences, usually impacting more than one variable. For example, not investing in the hand thinning of a heavy crop not only affects fruit size, but it will reduce return bloom in the next year, reduce fruit color and Brix at harvest, delay maturity, and perhaps result in an off flavor. Yes, BP will be reduced, but at a very heavy cost. The light crop produced next year will be characterized by excessively large fruit ravaged by BP. I think it's unlikely you can successfully implement any practices that will mitigate the BP under those circumstances. Bottom line, HC is a variety that requires hands-on management and close attention to detail, nothing like the other varieties we grow.

General Recommendations for Eastern New York State:

Condition Honeycrisp for 7 days post-harvest at 50°F, then store at 38°F in both the Hudson and Champlain Valleys. The objective is to reduce chilling injuries such as soft scald and soggy breakdown. Conditioning and warmer storage temperatures increase BP somewhat, however, losses to chilling injury in the Hudson Valley appear to be increasing and when they happen, soft scald losses

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eclipse BP losses significantly.

- The Hudson Valley is a world of many varieties generally stored on-farm. With Gala, McIntosh, and Honeycrisp harvest timings colliding with each other and closely following Paula Red and Jonamac, producers rarely have a free storage room to devote to 50°F conditioning or even dedicated HC storage. Consider how to best balance your storage risk in high BP situations by mixing varieties in rooms of limited storage duration where the warm HC temperature will have only a minimal impact on those varieties which are best when stored at 33°F. Short on HC conditioning space? At least in lower volume situations, a reefer body running at 50°F can handle 50 bins, although, in that case, removing the initial field heat is best accomplished in a standard cooler. This is not as efficient as a dedicated storage room, but it can work when space is tight on smaller farms.

Figure 2. Honeycrisp bitter pit in the wholesale supply chain. For your eyes only, not your customers!

- Consider the customer satisfaction consequences of putting high BP risk fruit, say over 30%, into the marketplace. A tough decision but this will balance the cost of an unhappy buyer and load rejections (Figure 2). As quality standards tighten, those high BP M.26 blocks may be more of a liability than they are worth.
- Avoid excessive irrigation in the second half of the season. I included a link below to a Good Fruit grower article that discusses the research of Dr. Lee Kalcsits (WSU) on the deficit irrigation of HC.
- The early physical removal of fruit buds (precision pruning), flowers (pollen tube model thinning), and aggressive early thinning strategies (precision thinning) can aggravate bitter pit. The effect may not be noticeable in low BP orchards like those on B.9, but can be significant if BP exceeds 20% as many Hudson Valley orchards do. I've not observed the same effect from bloom thinning with NAA. Again, every management decision with HC is a tradeoff—in this case, the balance between crop load and return bloom. Since early HC thinning doesn't seem to reliably enhance return bloom, its best to pick your battles on this one.
- Avoid the combination of G.41 and HC. Terrible bitter pit in most situations is coupled with a reduced fruit set issue, not to mention the potential for graft union breakage.

Recommendations for new 'Honeycrisp' plantings in bitter bit prone regions of NYS:

- Plant high-color strains
- Plant B.9 (for now) and choose a planting density compatible with your site and local experience. I prefer 2.5' x 10' for the B.9/Honeycrisp combination in ENY.
- Avoid replant sites or at least implement a multi-year remediation plan on replant ground. Sorghum/Sudan is a nice cover crop mix prior to planting apples. The fallow period also provides a window to gain control over difficult perennial weeds.
- Adjust soil to a pH of 7.0 and incorporate amendments to correct mineral deficiencies.
- Take all necessary steps to maximize vegetative growth during the first few years.
- Avoid cropping in the second leaf, as HC tends to settle down quickly once it's allowed to crop. Unfilled canopy space = low yields for the life of the planting.

Recommendations for an established orchard planted on B.9:

- Maintain pH and a balanced program of soil fertility. Follow Dr. Lailiang Cheng's and Mario Miranda-Sazo's recommendation to moderate potassium fertilization. Muriate of Potash can become quickly available to the tree if water is applied. Less K is required in an off year.
- Avoid the use of Prohexadione calcium (commercially formulated and sold as Apogee and Kudos) at any time, as you already have a low-BP rootstock with low-vigor characteristics.
- Maintain a consistent annual cropping program based on NAA at bloom, followed by NAA & carbaryl as needed according to the carbohydrate thinning model.
- If needed, hand-thin early to touch-up or correct thinning mistakes and apply 4 summer NAA sprays at 5 ppm to encourage return bloom.
- Set the kings, avoid doubles. Lower BP in king fruit, at least under low-BP conditions.
- Start a foliar calcium program at petal fall, 5-weekly applications, continue every two weeks into mid-August.
- No need to spend time or money on bitter pit prediction. BP will be reliably low; fruit from B.9 orchards will be your go-to for longer-term storage.
- Allocate your 1st pick into 60-90d (or longer) storage, maximize the economic potential of your low-BP orchards by prioritizing them for storage and later sale at higher FOB's.
- Allocate your 2nd and 3rd picks into longer-term storage (90d+).

If an established orchard is planted on M.9, M.26 or others, then:

- Maintain pH and a balanced program of soil fertility. Follow Dr. Lailiang Cheng's and Mario Miranda-Sazo's recommendation to moderate potassium fertilization. Muriate of Potash can become quickly available to the tree if water is applied. Less K is required in an off year.
- Apply a single application of Prohexadione calcium (Apogee or Kudos) at pink stage. Adjust the timing slightly to catch a 60°F application window.

(Continued on page 9)

(Continued from page 8)

- Do Not Apply Prohex after bloom. Research has demonstrated that there is a significant risk of aggravating BP with post-PF applications and research has also shown that whatever competition occurs between shoots and fruits, especially in the summer, it does not reliably aggravate BP.
- Maintain a consistent annual cropping program based on NAA at bloom, followed by NAA & carbaryl as needed according to the carbohydrate thinning model.
- If needed, hand-thin to touch-up or correct thinning mistakes and apply 4 summer NAA sprays at 5 ppm to encourage return bloom.
- Set the kings, avoid doubles. Lower BP in king fruit, at least under low-BP conditions.
- Start a foliar calcium program at petal fall, even as early as pink (but not tank-mixed with your Prohex application) 5-weekly applications, continue every two weeks into mid-August.
- Implement the bitter pit prediction protocol of your choice. The EMR prediction model and the "Passive" prediction protocols were developed in NYS and were properly validated. Identifying potential BP storage disasters is worth the cost of $70 for HC orchards up to 5 acres in size. BP prediction is not only for the large wholesale producers. Smaller retail operations that want to continue in operation supplying quality HC through the winter and spring need low BP fruit as well.
- Allocate your 1st pick for immediate sale if your prediction model suggests BP in the 10-20% range. As mentioned earlier, predicted BP over 30% (reality check: 50% of HV orchards experienced BP over 30% in 2021) presents a rejection risk in the retail supply chain.
- Allocate your 2nd pick into 60-90d storage.
- Allocate your 3rd picks into longer-term storage (90d+) if you must.

Future Direction: What do we need?

Follow all the steps above, and unfortunately, you'll often continue to be disappointed with the BP observed in many orchards. We need to:

- Identify a low-BP rootstock for 'Honeycrisp' that is a little more vigorous than B.9 for replant situations and sites with weak soils.
- Continue work with plant growth regulators to find materials or combinations that improve the delivery and distribution of calcium ions within the fruit.
- Identify the gene(s) that influence the delivery and distribution of calcium within the fruit and deal with them through conventional plant breeding techniques, genetic engineering, or even using plant growth regulators to influence gene expression.
- Develop production economics studies of established Honeycrisp orchards that are producing too much lower quality fruit. At what point do we fire up the dozer?

To conclude, the goal of this article was to suggest action items that you can implement to reduce losses to bitter pit. The causation question is another matter entirely. What we see expressed on the fruit's surface visually is the death of individual cells through desiccation following the structural failure of the cell membrane. However, this result is clearly not a random event attributable to the "global" status of calcium content in the fruit. We see variability of symptom expression at the fruit, tree, orchard, and storage level. I say "symptom expression" because we only know what we can see. Are there other groupings of weakened cells in a particular fruit that might have expressed visual symptoms of cell membrane failure if only they experienced a differing set of conditions during development and/or storage? Colleagues and I describe BP as a "calcium-related disorder", which is different than saying it's a straight-up global calcium deficiency. What exactly constitutes "related" is the open question; we have several hypotheses, but no consensus. The topic of causation is its own discussion, and our work continues.

Resources if you're interested in a deeper dive into the data

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Early Application of Chemical Thinners Should be Revisited

Duane W. Greene, James Krupa Stockbridge School of Agriculture, University of Massachusetts

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Chemical thinning remains the most challenging management component in apple production that a grower must do. This situation has become even more challenging and difficult in recent years due to the wide variation in temperature frequently experienced during the thinning period that appear to be associated with climate change. In the past, we have depended upon the thinning strategy that is termed the "Nibble" approach where several applications of thinners are applied at reduced rates over the thinning period. Yes, we have experienced some temperature fluctuations in the past, but this approach has become less useful in recent years because of unreliable and often extreme weather conditions (both hot and cold) that we have experienced with increasing frequency during the thinning period that have resulted in unsatisfactory thinning.

There are significant advantages to thinning apples early. We acknowledge the usefulness of thinning done during the dormant period and the use of caustic thinners applied at bloom but these techniques are not frequently used. However, in this experiment we focused on the application of hormone thinners at both bloom and petal fall. Thinner application at bloom and petal fall thinners in the eastern United States is not new, but the hormone-type thinner rates used have been moderate at best and the end results are frequently disappointing. The purpose of this experiment was to try to identify bloom and petal fall treatments using either naphthaleneacetic acid (NAA) or naphthaleneacetamide (NAD) that would result in significant thinning and to determine if trees receiving either of these treatments would be thinned easier with a different thinner applied later at the 10-14 mm fruit size stage.

Materials and Methods

A block of mature Buckeye Gala/ Bud 9 was selected and 36 uniform trees were identified. At the pink stage of flower development all spur blossom clusters were counted on each tree. The trunk circumference was measured on these trees at 30 cm above the bud union. The blossom cluster density was then calculated by dividing the number of flowering spurs by the tree trunk cross sectional area. Trees were then blocked into six groups (Reps) based upon blossom cluster density. Within each group trees were randomly assigned to receive one of six treatments.

Treatment details. Two sets of trees received a bloom spray of 12 ppm NAA containing 1 pt/100 gal of the surfactant Regulaid®. This same group of trees was sprayed at petal fall with 12 ppm naphthaleneacetic acid (NAA) plus 1 pt/100 gal of Regulaid® and 1 pt/100 gal of carbaryl. Two other sets of trees were sprayed at bloom with 8 oz/100 gal naphthaleneacetamide (NAD) with 1 pt/100 gal Regulaid®. These trees were again sprayed at petal fall with 8 oz/100 gal of NAD plus 1 pt/100 gal of Regulaid® and 1 pt/100 gal of carbaryl. A third set of trees was sprayed with 125 ppm MaxCel® plus 1 qt carbaryl/100 gal at the 10 mm fruit size stage. One group of trees that previously was sprayed with the NAA treatments and one group of trees that received the NAD treatments was also sprayed with 125 ppm MaxCel® and 1 qt carbaryl at the 10 mm stage. All treatments were applied using a commercial airblast sprayer delivering the TRV dilute volume of 100 gal/ acre. Temperature maximum and minimum, the carbon balance and the thinning recommendation for several days before, on the day of, and several days following spray application at each of these spray timings, as shown on the NEWA website, are shown in Table 1. Details of the spray applications are summarized in Table 2.

The weather conditions surrounding the bloom spray application (May 7) can be characterized as being unfavorable for thinning. In general, the high temperature averaged about 60º F and the low temperature was near 45º F. NEWA suggested that thinning recommendations should be increased by 30%. Weather conditions near the petal fall (5 mm) spray (May 17) were favorable for thinning with high temperatures hovering near 80º F. The NEWA website suggested to reduce the normal thinner application by 15%. The last thinning spray was applied when the fruit diameter averaged 10.4

Table 1. Weather data prior to and following application of thinning treatments on Buckeye Gala/B.9 apples. Belchertown, MA, 2021.

Date	Temp max	Temp min	CHO daily balance	Degree day accumulation	Thinning recommendations
May 3	68	50	-26	10	Increase by 30%
May 4	58	49	-16	21	Increase by 30%
May 5	53	46	-15	36	Increase by 30%
May 6	62	44	+13	42	Increase by 30%
May 7 (Bloom)	61	42	+2	49	Increase by 30%
May 8	57	43	+4	55	Increase by 30%
May 9	61	40	+15	61	Increase by 30%
May 10	59	45	+1	68	Increase by 30%
May 11	59	45	+22	76	Increase by 30%
May 12	62	41	+17	82	Increase by 30%
May 13	69	41	+21	91	Increase by 30%
May 14	75	43	+2	102	Increase by 30%
May 15	75	48	-6	114	Apply standard rate
May 16	70	55	-23	128	Increase by 30%
May 17 (PF, 5 mm)	74	47	-13	140	Apply standard rate
May 18	80	51	-24	154	Decrease by 15%
May 19	84	54	-35	173	Decrease by 15%
May 20	81	51	-16	185	Decrease by 15%
May 21	82	52	-23	201	Decrease by 15%
May 22	86	58	-60	219	Apply standard rate
May 23	81	57	-40	236	Apply standard rate
May 24	68	50	+16	246	Apply standard rate
May 25 10 mm	74	47	+21	258	Increase by 30%
May 26	87	58	-28	277	Increase by 30%
May 27	75	58	+6	292	Increase by 30%
May 28	59	44	+26	299	Increase by 30%
May 29	47	42	+4	302	Increase by 30%
May 30	48	45	-15	306	Increase by 30%

mm (May 25). The weather the day of application and for the two days following was somewhat favorable for thinning but after that, low temperatures prevailed. At the time of application, the NEWA website suggested that the thinner rate should be increased by 30%. Because of the design of the experiment, it was possible only to relate weather information specifically to thinner activity for only the 10 mm fruit size spray (Treatment 6).

Results

Bloom and petal fall thinner applications containing either NAA (Treatment 2) or NAD (Treatment 5) thinned comparably, but neither reduced the crop load enough to be commercially acceptable (Table 3). Application of 125 ppm MaxCel® plus 1 pt of carbaryl per 100 gal at the 10 mm fruit size stage resulted in some reduction in crop load, but the thinning intensity was not sufficient be commercially acceptable. When trees that were previously sprayed at bloom and petal fall with either NAA or NAD containing sprays were also sprayed with MaxCel® plus carbaryl, the resulting thinning was significantly improved, and there were no statistical differences between trees that received the different bloom and petal fall sprays. Fruit weight at harvest was the only harvest parameter that was significantly improved or changed by the thinning treatments. Fruit size increase mirrored the extent of thinning; the greater the thinning, the larger the final fruit size.

Discussion

In recent months there has been a great deal of discussion about climate change and how it affects many aspects of our lives. Fruit growing and apple production are no exceptions. Discussion often centers around global warming. Fruit growers have the capacity to adapt to changes that will allow them to grow fruit under warmer conditions. Therefore, from a cultural standpoint, production of fruit under warmer conditions may not be a barrier for growers in New England. However, the erratic and unpredictable weather that is occurring is posing enormous challenges. Chemical thinning is one area that is particularly influenced by temperature. This situation is further exacerbated by the relatively short time that chemical thinners may be used effectively. For chemical thinners to work effectively, they must be applied when warm temperatures occur following application. Cold temperatures following application generally result in little or no thinning.

The experiment that is reported on here was designed, in part, to determine if the use of more aggressive thinner combinations at bloom and petal fall would lead to a reduction in crop load close to the final desired level. The choice of thinners was made with the hope that the rates selected would not be too high to preclude grower use. Clearly, in this experiment these sprays under-thinned, so more aggressive rates would have been required under the weather conditions that prevailed at the time to achieve more acceptable thinning.

NAD presented a challenge since the label limits the application rate to 8 oz/100 gal (50 ppm), and by nature it is a mild thinner. The

Table 2. Influence of thinner combinations (NAA, NAD, Carbaryl, MaxCel) applied at 3 fruit growth stages on fruit of Buckeye Gala/B.9 apples. 2021.

Treatment[1]		Time of application[2]			Fruit Set	
		Full bloom	Petal fall	10 mm	Fruit/cm LCSA	Percent set
1	Control	---	---	---	15.4 a	128 a
2	NAA 12 ppm + Regulaid 1 pt/100 + Carbaryl 1 pt/100 (PF only)	+	+		9.9 bc	85 bc
3	NAA 12 ppm + Regulaid 1 pt/100 + Carbaryl 1 pt/100 (PF only) + MaxCel 125 ppm + Carbaryl 1 qt/100	+	+	+	10.1 bc	87 bc
4	NAD 50 ppm + Regulaid 1 pt/100 + Carbaryl 1 pt/100 (PF only)	+	+		11.6 b	88 bc
5	NAD 50 ppm + Regulaid 1 pt/100 + Carbaryl 1 pt/100 (PF only) + MaxCel 125 ppm + Carbaryl 1 qt/100	+	+	+	8.0 c	67 c
6	MaxCel 125 ppm + Carbaryl 1 qt/100			+	11.0 bc	95 bc
Significance					***	***

[1]Treatments applied on May 7 (Bloom), May 17 (PF, 5.1 mm) and May 25 (10 mm).

Table 3. Influence of thinner combinations (NAA, NAD, Carbaryl and MaxCel) applied at 3 fruit growth stages on fruit quality parameters at harvest of Buckeye Gala/B.9 apples in 2021.

Treatments[1]		Time of application[2]			Fruit weight (g)	Flesh firmness (lb)	Soluble solids (%)	Starch rating (1-8)
		Full bloom	Petal fall	10 mm				
1	Control	---	---	---	116 d	16.6 a	10.5 a	4.7 a
2	NAA 12 ppm + Regulaid 1 pt/100 + Carbaryl 1 pt/100 (PF only)	+	+		140 c	16.0 ab	10.4 a	5.3 a
3	NAA 12 ppm + Regulaid 1 pt/100 + Carbaryl 1 pt/100 (PF only) + MaxCel 125 ppm + Carbaryl 1 pt/100	+	+	+	156 ab	16.1 ab	10.7 a	5.5 a
4	NAD 50 ppm + Regulaid 1 pt/100 + Carbaryl 1 pt/100 (PF only)	+	+		136 c	15.9 b	10.2 a	5.5 a
5	NAD 50 ppm + Regulaid 1 pt/100 + Carbaryl 1 pt/100 (PF only) + MaxCel 125 ppm + Carbaryl 1 qt/100	+	+	+	165 a	16.2 ab	10.9 a	5.4 a
6	MaxCel 125 ppm + Carbaryl 1 qt/100			+	145 bc	16.4 ab	10.7 a	5.2 a
Significance					***	NS	NS	NS

[1]Treatments applied on May 7 (Bloom), May 17 (PF, 5.1 mm) and May 25 (10 mm).

[2]FB – Full bloom, PF – Petal Fall and 10 mm – fruit size 10.4 mm.

addition of the surfactant Regulaid® at 1 pt/ 100 gal was used in an attempt to increase NAD activity. No adverse effects were noted. NAD has been reported to cause pygmy fruit to form on some varieties if applied during the 10 mm or later fruit size stages. Although pygmy fruit were not counted, none were noted at harvest time on trees receiving any of the thinner sprays. The rate of NAA could be increased to 15 or 20 ppm but there may be some reluctance on the part of growers to do that.

MaxCel® at 125 ppm plus 1 pt/100 gal of carbaryl was applied at the 10 mm stage. That rate is higher than is recommended in the spray guide. Only modest thinning resulted and the final crop load on trees was nearly identical to the crop load on trees receiving the bloom and petal fall treatments containing either NAA or NAD. Additional thinning resulted when the 10 mm MaxCel® plus carbaryl spray was combined with either of the bloom and petal fall treatments.

The thinning results from bloom and petal fall applications of the NAA or NAD containing sprays appear to be identical or at least not statistically different. However, before suggesting that the treatments can be used interchangeably, we must wait until the spring. We will then be able to quantify return bloom in this experiment. We did a thinning experiment using NAA and NAD as the thinners on Macoun in 2016. When return bloom was taken the following spring, trees that received NAD as a thinner had significantly less return bloom, even though final crop load at harvest was similar to the crop load on trees receiving other thinning treatments.

Each thinning season is different. It is not possible to look into a crystal ball to learn what thinning opportunities or barriers you will face. If the return bloom appears to be good and no winter injury or frost damage has occurred, we suggest that you should be as aggressive as you feel that you can possibly be early. This may include doing some thinning with dormant pruning after first estimating the blossom cluster density on the trees. It may be prudent to be very aggressive with bloom and petal fall sprays. Historically, there has been reluctance on the part of growers to thin aggressively at bloom and the petal fall sprays and frequently an early application is a petal fall spray containing only the mild thinner carbaryl. **Keep in mind that trees are far less sensitive to thinners at bloom and petal fall**. I have never over-thinned an apple tree by applying hormone-type thinners at either bloom or petal fall or at both of these times of application.

FSMA Inspection and On-Farm Readiness Review Updates

Elisabeth Hodgdon, CCE ENYCHP and Craig Kahlke, CCE LOF

Is your farm ready for a FSMA Produce Safety Rule Inspection? As the growing season begins, the New York State Department of Agriculture and Markets is booking inspections and educational On-Farm Readiness Reviews around the state to see farm activities in action. For the second year in a row, all farms covered by the Produce Safety Rule are eligible for inspection. Inspections of farms following qualified exempt requirements will be scheduled at a later time to be determined. Routine inspections (second inspections) will be scheduled for large and small farms as need and schedules allow in 2022. Farms of all sizes and exemption statuses are eligible to sign up for an On Farm Readiness Review this season. An On Farm Readiness Review is a free, confidential educational visit to the farm by a NYSDAM representative and CCE educator.

The visit includes a walk around the farm to observe activities while having a conversation regarding food safety practices. At the end of the visit, no notes or photos are taken off the farm. The farm is provided with guidance and resources to improve food safety prior to an official inspection; the OFRR itself is not an inspection. If you'd like to learn more and/or sign up for an On Farm Readiness Review, contact Steve Schirmer at (315) 487–0852 or steve.schirmer@agriculture.ny.gov.

Still unsure whether your farm is fully covered, exempt, or qualified exempt? A good place to start is to take a look at your farm's sales figures and use the "Coverage and Exemptions/Exclusions Flow Chart" on the FDA's Produce Safety Rule Website to see where your farm falls. Very small farms selling less than $25,000 worth of fresh produce are fully exempt. Farms selling less than $500,000 of food (baked goods, milk, meat, hay and animal feed, etc.) are eligible for a qualified exemption based on the type of sales. These sales figures are adjusted for inflation and are currently $29,245 and $584,908, respectively, for average sales 2019-2021.

For those who are familiar with the Produce Safety Rule and have taken the Produce Safety Alliance Grower Training Course, you may recall that the water and soil amendment subparts of the Produce Safety Rule are subject to change. No updates regarding the soil rules have been released, but the comment period recently closed for the FDA's proposed water rule. For more info, see Craig Kahlke's articles in issues 3 & 5 of this year's Fruit Notes newsletters. In addition, you can also view the recorded webinar from the March 11th virtual meeting for the Northeast states on the proposed agricultural water requirements for the FSMA Produce Safety Rule here.

If you have questions regarding your farm's coverage status, you may contact Steve Schirmer, (315) 487-0852 or steve.schirmer@agriculture.ny.gov, or your region's NYSDAM produce inspector for assistance. Additionally, CCE is available to assist you with resources and guidance in improving food safety on your farm. Contact Elisabeth Hodgdon (518-650-5323 or eh528@cornell.edu) for more information.

Amid Thin Label Changes

The new Amid Thin label has been approved and is now labeled in NY.

There are only a few, but important changes.

1. The label now clearly states applications are permitted in full bloom (old label only stated petal fall and post bloom uses).
2. New varieties added and grouped according to thinning response – easy, moderate, and difficult to thin categories.
3. The rate range for apples is now tied to thinning response category rather than variety specific recommendations.
4. The 400 gallon/A column in the thinning tables has been removed.

Additionally the label now provides guidance on the ideal temperature range for application. It states "apply when daytime temperatures are between 65°F to 85°F. Do no spray when daytime temperatures are below 50°F". The key thing to remember is the exact stage of bloom e.g. early, mid, late, is less important than the weather conditions at the time of application. For best results, it's advised that growers apply Amid Thin when ideal temperatures are predicted within the bloom period through petal fall. Understandably, in some years ideal conditions over 65°F are hard to come by.

Nitrogen, Potassium, and Calcium Recommendations for 'Honeycrisp' are Different than for Most Other Cultivars

Terence Robinson, Lailiang Cheng, and Mario Miranda Sazo , Cornell University

The recommended levels of N, K and Ca for 'Honeycrisp' are different than the suggested levels on the standard leaf analysis we use for most other varieties. For N we recommend a leaf level of 2.0% (this is similar to what we recommend for McIntosh). For hard varieties like Gala, Delicious, Empire, Rome's etc. we recommend a leaf level of 2.25% but for Macs we have always recommended a lower level of 1.9-2.0. Honeycrisp should be managed like Mac's in terms of N. If you have leaf analysis results from last summer (leaf samples take in early to mid-July) then use the following three rules to determine N fertilization rates.

-**For blocks with leaf N lower than 2.0%** we suggest 20 to 50# of N per year to keep the tree vigor from falling too low. If tree vigor falls too low then no new renewal shoots develop from limb renewal pruning cuts.

-**For blocks with a leaf N level between 2.0 and 2.25%** we suggest slightly lowering the rate of N from last year's to allow a gradual lowering of leaf level to the 2.0% target.

-**For blocks with a leaf N level >2.25%** we suggest no ground applied N.

K fertilization of Honeycrisp is often tied to increased biter pit; therefore K fertilizers must be applied with caution and only when leaf analysis results suggest additional K is needed. Based on our recent work published in the Fruit Quarterly winter issue 2021 (Cheng and Miranda Sazo), we developed a new recommended leaf K levels of 1.0%. This is lower than other varieties such as Empire and Gala where we strive to elevate leaf K levels to 1.35-1.8%. This high K level for those varieties helps give large fruit size but with Honeycrisp that high of K gives excessive biter pit. Based on leaf K levels, we suggest you use the following three rules to determine K fertilization rates.

-**For blocks with leaf K lower than 1.0%** we suggest 60# of K20 per year to keep fruit size from being too small.

-**For blocks with a leaf K level between 1.0 and 1.2%** we suggest 30# of K20 per year to maintain good fruit size.

-**For blocks with a leaf K level >1.2** we suggest no K fertilization until leaf level drops below 1.2%.

Ca fertilization is achieved by additions of lime before planting and at bi-annual intervals after planting. Honeycrisp requires higher levels of Ca than other varieties and we recommend a level of 2.0% which is on the high end of the recommended range for Ca level in the leaf. We have been suggesting for the last 2 years to add lime even if soil pH is in the recommended range (between 6.5 and 7.0). In a survey we did, the best performing blocks had pH of ~7.2 and about 5000# of Ca per acre from a soil test. Based on leaf Ca levels, we suggest you use the following four rules to determine lime fertilization rates.

-**For blocks with leaf Ca lower than 1.3%** we suggest 4 tons of lime every other year to raise soil calcium level even if pH goes to 7.1 or 7.2. If soil pH goes above 7.2 then add gypsum instead of lime.

-**For blocks with a leaf Ca level between 1.3 and 1.8%** we suggest 2 tons of lime every other year to raise soil calcium level even if pH goes to 7.1 or 7.2. If soil pH goes above 7.2 then add gypsum instead of lime.

-**For blocks with a leaf C level between 1.8 and 2.0%** we suggest 1 ton of lime every other year to maintain soil Ca.

-**For blocks with a leaf Ca greater than 2.0%** we suggest no lime but add gypsum until soil Ca level is ~5000 lbs. per acre.

Upcoming Events

Thinning meetings will be planned for the Hudson Valley, Capital Region, and Champlain Valley; including in-person fruit set meetings. Keep an eye on your e-alerts for dates and locations to be announced.

In Case You Missed It: New Recordings, Online Courses, and Online Materials

Michael Basedow, CCE ENYCHP

If you haven't been on the ENYCHP YouTube page in a while, I recommend giving it a look through. **We have the recording of our Pre-bloom "Pink" meeting that was held on Thursday April 28 on the LOFT YouTube page here:** https://youtu.be/pOBVnoSEIa8. " We also have recordings from our "What's new in crop load management webinar" available at the following link: https://www.youtube.com/watch?v=UDxEaQDkU04&list=PLk2Q-bw9Aiu6PXq-obah0nVqh8h8J3CcV

We've also got the recording of Dr. Kerik Cox's talk on biological materials for fire blight management here: https://www.youtube.com/watch?v=N0PrdYyShok&t=137s

We cohosted a number of webinars in association with the Northeast Fruit Consortium this winter. Those recordings are available on the UMass Extension Fruit Team YouTube channel here: https://www.youtube.com/watch?v=hBjdq_Iuvbc&list=PLr5-TRBPQxrGKlIxCGCr2ZQujumtZPQRE

The Northeast Cider Apple Project webinar can be viewed here: https://www.youtube.com/watch?v=9TnRk-kN1VI

The new Pruning Guide for Precision Crop Load Management video is available on the LOFP YouTube channel in both English and with Spanish subtitles.

If you have employees that are interested in getting their private pesticide applicator certification, but aren't sure where to start the process, they might want to enroll in our online certification training course. This course includes recorded lectures and practice exams, and walks through what you need to do to sign up for the exam, some of the core material, and strategies for the category exam. It is available for $5 for ENYCHP enrolled farms at the following link: https://cce-enychp.teachable.com/p/pesticide-certification-exam-prep-course

Finally, we are also in the process of updating the Cornell Tree Fruit Resources website. The link to that is available here. https://blogs.cornell.edu/treefruit/ If you have any recommendations on how we can improve this page, or any of our other online programming, please reach out to me at mrb254@cornell.edu or at 518 410 6823.

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The Eastern New York Commercial Horticulture Program is a Cornell Cooperative Extension partnership between Cornell University and the CCE Associations in these seventeen counties: Albany, Clinton, Columbia, Dutchess, Essex, Fulton, Greene, Orange, Montgomery, Putnam, Rensselaer, Saratoga, Schenectady, Schoharie, Ulster, Warren & Washington.