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Honeycrisp and Bitter Pit: Commercial Orchard Performance of the EMR and Passive Prediction Models

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What is Bitter Pit? Bitter pit (BP) is the visual manifestation of fruit tissue desiccation under the skin, with dark, sunken spots on the fruit surface and corky tissue underneath, and not centered on a lenticel (a characteristic of lenticel breakdown) (Figure 1). Bitter pit is not a problem in all apple varieties. In New York State, Honeycrisp, Braeburn and Cortland are commonly afflicted, while worldwide we can add Golden Delicious "Smoothee" and Fuji to the list. Considered to be a *calcium-related disorder*, the questions of why calcium was deficient in an individual BP afflicted fruit, but not the one close by or even on the same spur, why a specific grouping of cells desiccates to produce a visible lesion, not just individual random cells, and at what time in that fruit's development those cells became deficient is not well understood. Also not well understood are the variables that constitute the "related" part of the disorder, for example certain soil attributes such as mineral and moisture status, fruit size, tree vigor, crop load, and thinning timing.

Figure 1: A severe case of 'Honeycrisp' bitter pit after 60 days in refrigerated storage.

The refrigerated storage of 'Honeycrisp' is a financially risky proposition, especially in the Hudson Valley of New York State. When asked about Honeycrisp marketing strategy, most producers respond, "Sell as quickly as possible in the fall. Don't store the fruit". As the fall market becomes saturated, FOB pricing can drop, reducing grower returns. Marketers experienced this phenomenon from November 2019 onward as the FOB Honeycrisp price literally collapsed overnight (Figure 2, next page). Strong FOB's are essential for HC profitability, due to relatively low (2-year cumulative) yields due to a biennial bearing tendency, high cullage rates, and higher than average per-unit production costs for this very challenging variety.

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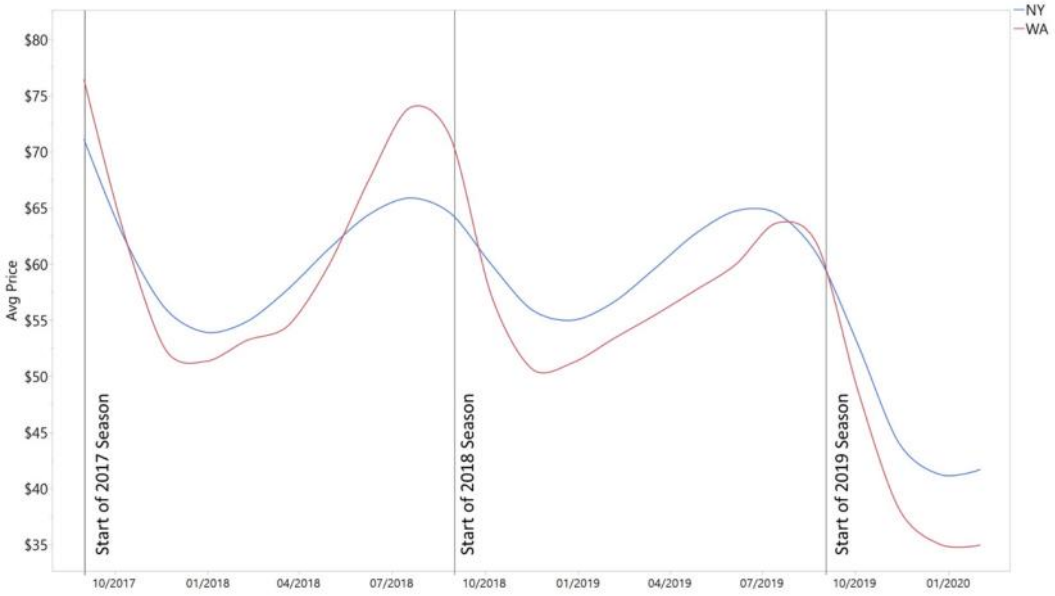

Figure 2: Seasonal 'Honeycrisp' FOB pricing September 2017 through January of 2020. The red line represents Washington State, the blue line New York. Note how FOB's for the 2019 crop started off only slightly less than 2018, but soon collapsed as the fall market became over-supplied.

Block	2016	2017	2018	2019
1	48.3%	5.6%	23.3%	15.8%
2	20.0%	1.7%	37.8%	27.5%
3	31.7%	32.2%	8.9%	36.7%
4	46.7%	11.1%	67.8%	6.7%
5	26.7%	4.4%	68.3%	13.2%
6	21.1%	13.3%	4.4%	6.7%
7	33.3%	2.2%	14.4%	13.7%
8	71.1%	47.8%	56.7%	69.8%
9	13.3%	3.3%	3.3%	8.3%
10		4.4%	16.7%	10.0%
11	63.3%	1.1%	70.0%	4.2%
12	43.3%	3.3%	48.9%	34.2%
13	11.7%	11.1%	5.6%	20.8%
14	26.7%	12.2%	18.9%	12.4%
15	17.8%	51.1%	50.0%	
16	12.2%	1.1%	4.4%	0.0%
17	24.4%	21.1%	37.8%	26.7%
18	17.8%	38.3%	55.6%	59.2%
19	36.7%	0.0%	58.9%	2.5%
20	32.5%	24.4%	70.0%	8.3%
21	5.6%	10.0%	4.4%	5.0%
22	2.2%	8.9%	13.3%	5.0%
23	0.0%	7.8%	18.9%	4.2%
24	0.0%	0.0%	1.1%	1.7%
25	5.6%	8.9%	3.3%	7.3%
26	20.0%	4.4%	2.2%	
27	28.9%	11.1%	12.5%	
28	1.7%	0.0%	2.2%	5.0%
29	13.3%	30.0%	10.0%	0.0%
30	17.8%	36.7%	65.6%	5.8%
31	35.6%	23.3%	27.8%	2.5%
32		4.4%	56.7%	0.0%
33	15.9%	16.7%	23.3%	2.5%
34	15.6%	8.9%	6.7%	
35	46.7%	21.7%	20.0%	4.2%
36	13.3%		6.7%	8.3%

Figure 3: Four years of bitter pit (BP) incidence history for 36 Eastern NY 'Honeycrisp' orchards. 'Green' represents blocks suitable for storage, 'yellow' are those with moderate BP incidence, and 'red' denotes problem blocks. Consistent cell color across all four years indicates the BP could be predicted reliably by simply keeping accurate historical records. Only 7 of the 36 blocks meet that criteria. The substantial variability within a given block from year to year underscores the multi-variable nature of the BP disorder.

Bitter pit can be partially suppressed through rootstock choice, consistent crop load management, application of 'Apogee ™' at pink stage, and the application of foliar calcium sprays during the cell division phase of fruit development. An alternative, and complementary, strategy toward the reduction of financial losses is to implement BP prediction protocols that will aid producers and marketers in the selection of orchard blocks for longer-term storage with greatly reduced risk of losses to BP which appears after 30 days+ in refrigerated storage. High variability makes BP prediction impossible when based only on block history or fruit appearance at harvest (Figure 3). From our 3-year survey study conducted from 2016-18, we observed:

- BP incidence varies by year, and at this point we really do not understand all of the factors involved.
- Some blocks are consistently high in BP, others low, but most show considerable annual variability.
- Unbiased BP incidence evaluation is a real challenge in the orchard at harvest:
    - The commercial fruit picking process results in a sample biased towards lower BP numbers, therefore evaluating BP in the bin by eye, counts, or over the packing line is inherently unreliable.
    - Depending on the season, BP symptoms can be rare at harvest, but appear after a short period of refrigerated storage. For example, in the Hudson Valley in 2018, BP incidence at harvest averaged 8.1%. An early version of our peel mineral analysis model was predicting a bad BP year, and this was announced to ENY producers via the E-Alert in late August. However, many producers at harvest were lulled into complacency by observations on the tree and in the bin of 'clean' fruit. Reality hits later on as Honeycrisp from the same "clean" blocks after 60 days of refrigerated storage averaged 34.3% BP incidence, resulting in serious financial losses and the cullage of entire storage lots.

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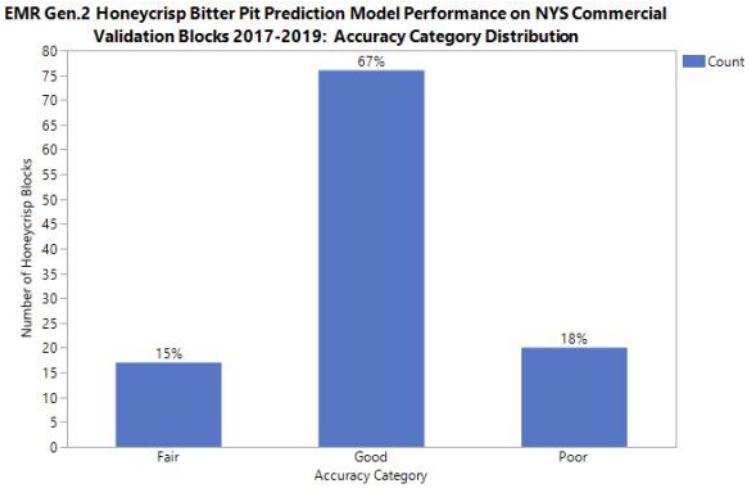

Figure 4: Observed distribution of independent validation blocks by EMR prediction performance category. "Good" blocks were accurate predictions either to store or not store. "Poor" decision blocks would have most likely led to lower financial returns.

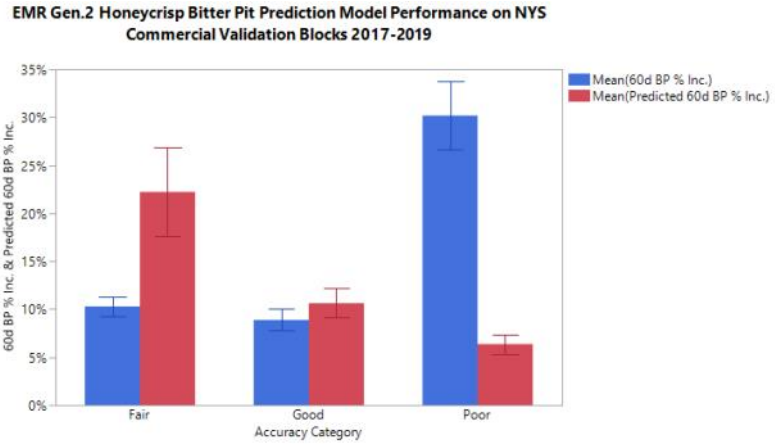

Figure 5: 67% of the decisions were "good", and the model was quite accurate. The average "fair" block (15%) would have been satisfactory to store long-term, but the model generally over-predicted the BP potential. Storing the average "poor" block (18%) would have been a costly storage management decision, and the model greatly underestimated the BP potential.

Commercial Performance of the "EMR" Model, 2017-2019

A three-year study (2016-2018) was established in Eastern New York State orchards to identify variables associated with BP expression, with the objective of developing an economical BP prediction model for producers, consultants, storage operators, and marketers to identify orchard blocks acceptable for storage. Thirty-six blocks with six trees each as experimental units, representing a wide range of BP incidence and rootstocks (M.9, B.9, M.26 and a few others) were identified and studied in the Hudson Valley and Champlain Valley regions. Fruit sampled at 35 days pre-harvest were peeled, separating the calyx end, and mineral content was analyzed. At harvest, mature fruit were sampled from three weekly commercial-grade picks and maintained in regular storage at 2.2°C for 60 days with no preconditioning. BP incidence was evaluated at 60 days of storage. The ratio of magnesium to calcium was chosen as the most reliable predictor of BP in this study. A quadratic regression model was constructed based on the Mg/Ca ratio modified by adjustment factors for degree-day accumulation during the cell division period of fruitlet growth, as well as rootstock, and tested against an independent validation data set of 36 ENY orchard blocks in 2017 and 2018. Results were encouraging, so the validation study was expanded to 80 orchard blocks statewide in 2019. Since the model considers three variables, (E)nvironment, (M)ineral analysis, and (R)ootstock choice, it is described by the acronym "EMR" (D.J. Donahue et al. In press).

How Well Does the EMR Model Work on a Commercial Scale?

The EMR model is currently in its 2nd generation of development, with the added experience of a 4th year of ENY development block data (2019). Considering 17 Hudson Valley validation blocks in 2017, 19 in 2018, and 77 blocks across NYS in 2019, BP prediction performance over the total of 113 blocks was found to produce useful BP prediction recommendations, although certainly not perfect. The overriding philosophy of this project is to develop a management decision tool that is inherently conservative. Put another way, if the model prediction is wrong, the error will more likely result in a low BP block not being stored, than the more financially damaging high BP block being placed into storage. Our BP storage threshold for Honeycrisp is arbitrarily set at 10% BP incidence following discussions with industry packers and storage operators. Model performance was categorized three ways:

1. **Good:** The model predicted the BP incidence observed in the validation sample with reasonable accuracy.
2. **Fair:** The model generally over-predicted BP such that a block that would have been ok for long-term storage was incorrectly rejected. This simply results in a missed opportunity for higher returns later in the marketing season. The negative consequences of the error were considered minimal, and perhaps would not even be noticed if not paying attention.
3. **Poor:** The model generally underpredicted BP, often significantly, and would have resulted in the storage of a block with substantial BP losses. This results in wasted storage space and increased packing costs.

The EMR model was found to suggest a "good" decision 67.3% of the time, a "fair" decision 15%, and a "poor" decision 17.7% (Figure 4). From a practical perspective, 82.3% of the recommendations could be considered acceptable, while 17.7% would be considered erroneous. The EMR model was reasonably accurate in absolute terms for the "good" category blocks, but severely under-predicted BP for the "poor" blocks (Figure 5). Our statewide validation project funded by the NYS Farm Viability Institute is continuing in 2020.

Commercial Performance of the "Passive" BP Prediction Protocol in 2019

"Passive" bitter pit prediction in Honeycrisp is a method developed by Drs. Yousef Al Shoffe and Chris Watkins that is totally "self-

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contained" and does not require outside mineral testing (Al Shoffe, Y. et al. 2019). Please read the article by Mike Basedow in our August Tree Fruit News for more detail (click here for the article), however the basic instructions are to randomly sample 120 apples from each Honeycrisp Block you might be considering for storage, approximately 3 weeks before harvest. Store the sample at room temperature. On the day before harvest, rate each 120 apple sample for bitter pit symptoms, simply yes or no. Calculate the % incidence using this formula: (# BP apples/#total apples)*100 = % BP incidence observed. Add 6 to this number and you have the predicted BP incidence for that block if you decide to store it for several months.

Example: 120 apple sample, 30 show BP symptoms, ((30 / 120) * 100) + 6 = 31% predicted BP incidence: Conclusion: not a good choice for storage.

How Well Does Passive Prediction Work When Implemented on a Commercial Scale?

In our independent validation study of passive bitter pit prediction conducted in 76 orchards around the Hudson Valley, Champlain Valley, and Western New York in 2019, we generally found good results.

- **The "Big Picture"**: Considering the 76 Honeycrisp blocks statewide, we found the model overpredicted BP incidence by 4 percentage points, 17.6% predicted vs. 13.6% actual. Possible explanations for this is include:
  - That our evaluation was made after 60 days in storage while the passive method was developed using fruit stored for 120. Bitter pit never improves in storage, and often worsens slightly as storage time advances. In practice, almost all the damage is incurred within the first 45 days.
  - For passive model development, only "clean" fruit was harvested and stored. This is common practice in post-harvest research since there is interest in isolating the effect of the storage regime on BP expression without having to rate for BP at harvest time. Our research and validation project includes a slightly different objective, determining the actual BP incidence, in total, for a particular orchard. Therefore, our validation method of storing a random sample of all fruit will invariably result in a slightly higher BP incidence than the passive method is designed to predict.
  - It is interesting to note that of the 76 validation blocks statewide, 45 would have been suitable for cold storage (BP incidence < 10%).
- **Judgement Calls:** Another way to consider a prediction model's performance is to set some arbitrary "difference" and look at how many of the predictions were within the selected differential. If we use 6% as our differential, we find that 27 out of 76 predictions were off by more than 6%, a success rate of 64.5%. However, as a practical matter, this assessment is too harsh. For example, the difference between a predicted 10% and a reality of 16% is much more significant a factor in the storage decision than the difference between 30% and 36%. When the predictions are considered from the viewpoint of the storage manager, not the scientist, prediction performance was acceptable, contributing towards a good storage decision 80.2% of the time.
- The second and final year of this New York Farm Viability Institute-funded passive model validation study is currently underway statewide for the 2020 season.

EMR Model BP Prediction for the Hudson Valley in 2020

Our Hudson Valley regional bitter pit prediction based on the EMR model for 2020 is 11.7% (Figure 6, next page). Regional prediction performance from 2016 through 2019 was good as shown in the graphic, closely following the ups and downs from year to year. Our Western New York mineral analysis is near completion, and the Champlain Valley analysis is underway but unfortunately results were not available in time for this issue of *Tree Fruit News*.

Discussion of Our Results to Date

Our model development process was initiated in 2016. The supporting model validation process was initiated in 2017 with the understanding that to properly evaluate any prediction model, validation testing must be conducted on a completely independent data set. There is an old saying "no battle plan survives the first day of fighting". It should be no surprise that the prediction performance of any model under commercial field conditions will be less accurate than the performance observed on its original development data set. As stated earlier, bitter pit is a multi-variable problem where we do not understand all the variables involved, how they interact, how to assign numeric values, or rank them for significance.

Of course, simple is often better, and the data shows (Figure 7, next page) that the Budagovsky 9 rootstock offers superior bitter pit performance. Common wisdom is that B.9 produces smaller fruit, and less terminal shoot extension (TSE), therefore less bitter pit. Our detailed study of the 36 ENY development blocks over three years unequivocally does not support the common wisdom. Our data shows fruit size and TSE for B.9 to be equivalent to M.9 and M.26 blocks in the study. Our findings on this topic will be addressed in a future article. While there are only two top-worked Honeycrisp blocks in the WNY validation portion of this study, BP incidence was observed to be 45 and 60%. Along with anecdotal field observations, it is clear that BP and top working to Honeycrisp does not end well.

In the spirit of keeping Honeycrisp storage decisions simple here are two recommendations:

1. With rare exception, Honeycrisp produced on the B.9 rootstock will be suitable for long-term storage and don't require BP prediction testing.
2. Avoid top-working established M.9 blocks over to Honeycrisp.

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3. Four years (minimum) of reliable BP incidence data could help identify those few blocks on your farm whose BP performance is either predictably good, or bad.

A commercially successful model must be reasonably easy to implement, timely in its prediction, and economical. A complicated model that requires extensive grower data collection and organization to maximize accuracy is not likely to be implemented by the farm manager who is always stressed for time. Both the EMR and Passive models cost in the range of $50-$70 per 1-5 acre block to implement, very reasonable. The Passive model expense is all labor, while the EMR requires substantially less physical labor, but does require some work peeling apples in the kitchen, followed by shipping expense.

2020 is certainly shaping up to be a different marketing year. The U. S. crop is slightly down, as likely will be the NYS Honeycrisp crop. In the aftermath of the 2019 marketing season, the general industry consensus is that the glory days of strong Honeycrisp FOB's are over. Perhaps Covid-19 and the slightly smaller crop will change that perception, and FOB's will improve. However, in the meantime we should pursue ways to extend our local Honeycrisp marketing season and avoid the depressed pricing of a flooded fall marketing season. Implementing bitter pit prediction technology is a step towards that goal.

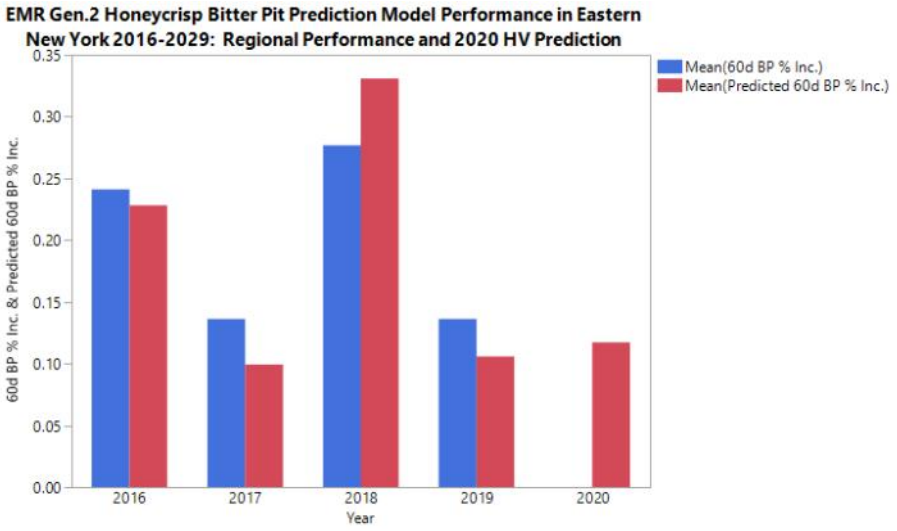

Figure 6: ENY Regional Honeycrisp bitter pit prediction performance of the EMR Gen.2 model from 2016 through 2019, along with a Hudson Valley prediction for 2020. The model was able to accurately detect the year to year variation experienced in Eastern NY. It is interesting that the model is not prediction a continuation of this alternating pattern, BP incidence may be similar to last season. (Champlain Valley mineral analysis for 2020 is in process at the time publication.)

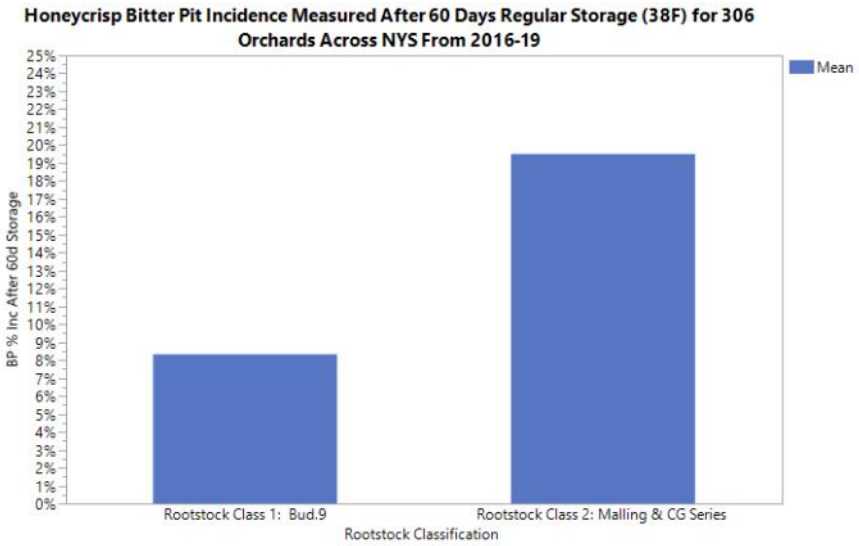

Figure 7: Across NYS, Budagovsky 9 stands routinely demonstrates superior Honecrisp bitter pit mitigation. Average BP incidence from 66 B.9 observations was 8.3% while Malling and Cornell Geneva series rootstocks in the study averages 19.5% incidence over 240 observations from 2016 through 2019. Most "Rootstock Class 2" rootstocks were EM.26 and EM.9 clones.

Acknowledgements

Many research, extension, grower, and independent crop consultants have, and continue, to contribute significantly to the success of this project. The authors would like to thank Dr. Michael Rutzke, Dr. Gemma Reig, Craig Kahlke, Elizabeth Tee, Anna Wallis, Jeff Alicandro, Vaughn Gingerich, Jim Eve, Andy Galimberti, and Sarah Tobin for their hard work and support. A special thank you to the 27 farms around NYS who have contributed orchard space and fruit to our effort. And finally, this project would not be possible without the financial and in-kind support from the NYS Apple Research and Development Program, the NYS Farm Viability Institute, the Cornell Cooperative Extension Eastern New York Commercial Horticulture Program, and the Cornell Hudson Valley Laboratory, thanks to you as well.

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Pre-Emergent Herbicides in the Fall—Advantages, Disadvantages, and Damage Symptoms

Michael Basedow, CCE Eastern NY Commercial Horticulture, Janet van Zoeren, CCE Lake Ontario Fruit Program, and Dr. Lynn Sosnoskie, Cornell AgriTech

Throughout the summer months, weed management predominantly consists of post-emergent (burndown) herbicides. These can damage any part of the apple tree if they come into contact with foliage, flowers, or fruit through drift, volatilization, or improperly cleaned spray tanks. We addressed post-emergent herbicide damage in depth in the August Tree Fruit News. Now, as we move into fall, we will discuss some of the advantages and disadvantages of using a pre-emergent (residual) herbicide after harvest this year to prevent early spring annual weed emergence, and will also discuss concerns regarding tree damage from these products.

Advantages / Disadvantages of Fall Residual Herbicide Use

A traditional weed management approach consists of a spring pre-emergent herbicide application, with follow-up post-emergent applications as necessary, to maintain weed control during the critical weed-free period of May through July. However, research led by Debbie Breth found fall-applied residual herbicide applications can provide excellent long-term control of weeds into the spring.

There are several advantages to applying your pre-emergent herbicide in the fall.

- Most pre-emergent herbicides need to be applied during a short pre-germination period in the spring, which can be problematic in wet years, especially when other time-sensitive orchard tasks may take priority.
- Fall weather in New York often provides relatively even precipitation that allows pre-emergent herbicides to be moved to the seed germination zone and activated.
- The fall application will reduce early seed germination the following spring, and will help keep the area around the trees weed-free over winter, which may help reduce rodent damage.

There are, however, disadvantages to applying residual herbicides during the fall.

- The fall application can be difficult to time if harvest is prolonged, or if there is an early cold snap, as some products do not work as well after a frost.
- Additionally, an orchard floor littered with dropped leaves and summer weed escapes will reduce the soil-herbicide contact needed to achieve effective weed control. If you choose to use a pre-emergent herbicide this fall, you might choose to pair it (or come in first) with a burn-down herbicide to clean up any summer weeds and prepare a bare herbicide-strip. This will knock back already emerged weeds, and will also help the pre-emergent herbicide to be evenly distributed across the soil, improving efficacy.
- Most residual products do not provide any control or suppression of established perennial weeds, so you may also want to pair this fall application with an auxinic herbicide, such as 2,4-D or clopyralid (Stinger) to help suppress problematic perennial broadleaf species (i.e. bindweeds, poison ivy, Canada thistle, etc).
- The elimination of winter annuals could result in bare ground at a time when soil erosion has potential to occur. Having bare ground throughout the winter months may reduce orchard soil quality over time, particularly in some of our sloped orchard sites here in Eastern New York.

Weeds in the herbicide strip at the time of the fall herbicide application may limit the efficacy of residual herbicides next spring. A fall application should also include, or be applied after, a post-emergent material. Photo: M. Basedow

The choice of using a pre-emergent herbicide in the fall or waiting until spring will probably depend on many factors, including post-harvest weather, other priorities in your orchard during fall or spring, and the weed species composition in your blocks. However, to provide better general guidelines on the effect of these timings on weed control, post-emergent herbicide use, soil quality, and tree health, we are currently conducting an ARDP-funded research project which will help provide answers to these questions over the next few years.

Residual Herbicide Damage Symptoms

Several of the pre-emergent herbicides have the potential to damage young trees, and some products are not labeled for young trees (e.g. Matrix cannot be used until 1 year following planting, Alion not until 3 years following planting). Re-plants in an older orchard block would be especially susceptible to accidental damage from these products.

Residual herbicides can cause tree damage if they are taken up by the tree roots. Some residual herbicides can also cause contact damage if deposited on leaves, flowers, or fruit through spray tank contamination, or on low-hanging branches weighed down by fruit. Below are some typical injury symptoms of a few of the more commonly used residual herbicide products:

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Matrix (rimsulfuron) injury commonly appears as yellowing and purpling of leaves, leaf crinkling, leaf distortion, and stunted growth. Matrix cannot be applied to trees until one year after planting. Be aware of re-plants, and turn off the sprayer near those young, sensitive trees.

Chateau (flumioxazin) has both pre-emergent and post-emergent activity on weeds, and therefore also has a greater chance to cause damage to the tree. Foliar contact can cause necrotic spots and leaf crinkling. Chateau should not be applied to trees in their first leaf, unless trees have a guard on during the application, to prevent any trunk contact.

Alion (indaziflam) damage can manifest as abnormal root and shoot tip growth, and mottling, puckering, or chlorosis of the foliage. Indaziflam has also caused soil line girdling on other perennial plant species, which can result in wilting, followed by a sudden collapse of the entire above-ground portion of the tree. Alion cannot be applied to trees until 3 years after planting. Be aware of re-plants, and turn off the sprayer near those young, sensitive trees.

Casoron (dichlobenil) damage symptoms include chlorosis and necrosis of the leaf margins. Casoron volatilizes easily in warm temperatures. For this reason, the Casoron 4G formulation can only be applied between November 15 to March 15, when soil temperatures are below 45°F, and the Casoron CS formulation is only labeled for use when air temperatures are below 70°F in the late fall to early spring. Casoron cannot be applied to trees until 1 year after planting.

There are a couple of websites with excellent pictures of herbicide damage. Visit and bookmark: the **University of California Herbicide Symptoms** page and the **OMAFRA Apple IPM Herbicide Gallery**. The newly hired Weed Scientist at Cornell University, Dr. Lynn Sosnoskie, has been tentatively approved for a grant to develop an online gallery of herbicide injury images across New York's specialty crops starting in fall of 2020, so look for updates about its progress.

Of course, not all mysterious damage is caused by off-target herbicide applications. Herbicide symptoms can be confused with damage caused by diseases, nutrition imbalance, drought, or winter injury. Some clues that herbicides may be a culprit include:

- Specific patterns of injury within the orchard block, such as damage predominantly in border rows, on one side of the tree, or only the outer leaves of the tree (drift shadows).
- Weeds showing similar symptoms near the orchard block, or between the orchard and suspected source of drift or volatilization.
- Symptoms that are consistent with recent herbicide applications made within or near the orchard.

To help identify herbicide damage, it is best to have a consistent way to keep records, both of all herbicide applications you make on your farm, as well as of any damage symptoms or other unusual things you notice while driving or moving through the orchard. Keep a pad and paper with you when scouting the orchard. If you see any unknown injury, jot down some notes if you notice any specific patterning, such as those described above. Be sure to document weather conditions at the time of and following application as well as details about travel speeds, nozzles used and heights, spray pressure, and weed density and canopy height.

In general, if you are concerned about herbicide damage to your orchard block, you can contact Mike Basedow (mrb254@cornell.edu) or Lynn Sosnoskie (lms438@cornell.edu).

COVID-19 Testing on Your Farm or Packing Shed—Why It's Important

Elizabeth Higgins, CCE Eastern NY Commercial Horticulture

I just drove my daughter to college in Western NY. Prior to arrival, she needed to send the school a recent negative COVID test, watch a training video on COVID, and self-quarantine at home for a week prior to arriving at school. Campuses across the nation have varied greatly in the measures they have taken, and many are already experiencing outbreaks as students arrive back to campus.

Likewise, many farms across the US are experiencing COVID outbreaks as harvest workers arrive from other places. It is easy to get complacent about COVID-19 in New York, our numbers of new cases have been going down and testing has improved. But unfortunately, we are not out of the woods yet. Many of the workers who are coming into NYS for fall harvest are arriving from places where COVID is more widespread and where social distancing and other protective measures like wearing masks have not been as consistently adopted. It is therefore important that you help to keep your farm's workers safe during the harvest and packing season. The best way to do this is to test your workers as they arrive, quarantine new arrivals, keeping them separate from the resident workers until they have a negative test result or show no symptoms, and train all workers in best practices for reducing the spread of COVID.

The surest way to have an outbreak spread is to not be aware of an outbreak occurring at your farm or food processing facility, so employing a preventative strategy is wise. In Ulster County and Clinton County the NYS Department of Health is setting up on-farm COVID testing to allow you to test your workers as they come in. Because some folks can be carriers of COVID and not show symptoms, it is important to test everyone, not just workers who appear to be sick. Identifying and quarantining COVID positive workers as soon as possible can help to reduce the chance that you will have a large-scale outbreak on your farm. If you are outside these counties, there are other resources for testing.

It's never a convenient time of year to add another burden onto a farm's plate, and that goes more than double for the onboarding process nearing harvest time. Housing availability and cost is clearly a difficult issue to address as is a potential two-week loss of employees during quarantine if they are found to be positive. But,

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keeping the farm employees safe, and the farmer and the farmer's own family safe, is of paramount importance. Catching two positives now (as occurred in an Ulster County farm earlier this summer) may mean you avoid transmitting the virus to the entire farm. While despite your best efforts, COVID may still spread, you will at least know that you did what you could do. In Washington State, a young worker from Mexico on a fruit farm died of COVID, and the farm is being investigated for not following guidance on housing. These are all part of the exceptionally complicated calculations farmers and public health officials are now making during COVID-19.

Resources:

NYS COVID-19 Farm Testing Initiative. https://agriculture.ny.gov/coronavirus Farm operators who employ temporary workers from outside of New York State and that are located in Clinton, Genesee, Orleans, Ulster and/or Wayne Counties can participate in the COVID-19 testing initiative. Testing is voluntary, free and will be set-up at sites selected by the farms who wish to participate. Farm operators should register to participate in a testing event by clicking on the link. Once registered, a representative from the mobile testing team will contact you. https://app.smartsheet.com/b/form/78fd67f98e104d1c95f533cb8ac9c200

Safe Harvest 2020: COVID-19 Office Hours for Producers and Packers Tuesdays in September at 4:00 PM. Offered by Cornell Ag Workforce Development and CCE. Producers and packers can join the event by computer or phone and can ask any COVID-19 related question. Last week questions addressed topics such as: testing strategies, face shields, establishing cohorts, and returning to work after recovering. Please sign up here, and also send us any questions you might have in advance when you register. https://cornell.zoom.us/meeting/register/tJYkcuqppz0sGNw2GGkaMiwmHibxQfxq7KuE

NYS County COVID-19 tracker - https://covid19tracker.health.ny.gov/views/NYS-COVID19-Tracker/NYSDOHCOVID-19Tracker-Map?%3Aembed=yes&%3Atoolbar=no&%3Atabs=n

Outlook for U.S. and NYS 2020 Apple Crop and Implications for Harvest

Mark Wiltberger, CCE Lake Ontario Fruit Program

On August 20th & 21st, U.S. Apple had its first-ever "virtual" *Outlook 2020* conference, instead of its usual conference in Chicago, because of the COVID-19 pandemic.

In addition to the industry presentations, the conference presents the forecast for the 2020 U.S. Apple crop (Table 1). U.S. Apple forecasts 253.8 million bushels for the 2020 national crop, just slightly lower than the 2019 USDA final survey and the 5-year average.

Table 1: U.S. Apple 202 Crop Forecast (units of thousands of 42-lb bushels)

	2019	2020		USApple	% change from	
	USDA	USDA	5-Year	2020	USDA	
States	FINAL	Aug Est	Average	Estimate	2019	5-Yr Avg
New York	31,429	30,952	31,786	32,000	2%	1%
Pennsylvania	12,071	10,000	11,948	8,500	-30%	-29%
Virginia	4,524	3,810	4,734	3,800	-16%	-20%
Total East	48,024	44,762	54,463	44,300	-8%	-19%
Michigan	22,524	21,905	24,529	22,500	0%	-8%
Total Midwest	22,524	21,905	26,852	22,500	0%	-16%
Total East and Mid-west	70,548	66,667	81,325	66,800	-5%	-18%
Washington	180,952	176,190	166,905	176,190	-3%	6%
California	7,262	6,429	5,900	6,429	-11%	9%
Oregon	3,571	4,286	3,886	3,886	9%	0%
Total West	191,786	186,905	176,691	186,505	-3%	6%
Total U.S.	262,333	253,572	258,805	253,305	-3%	-2%

Source: USDA, National Agricultural Statistics Service, Noncitrus Fruits and Nuts Summary, various years and USApple.

New York State

NYS projects 32.0 million bushels, just slightly higher than the 2019 USDA final survey and the 5-year average. The estimate is about 1 million bushels higher than the USDA August estimate of 30.95 million bushels and 2 million bushels higher than the Premier Apple Coop June estimate of 30.0 million bushels.

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A reduced crop is forecasted in the Hudson Valley due to freeze events early in the year and a hailstorm in June. The crop size in Western NY appears to be good. Freeze events in Western NY early in the year do not appear to have affected cropload significantly. However, there is uncertainty in the crop size due to the hot and dry conditions during most of the summer. The dry conditions may affect fruit size for unirrigated blocks and precipitation between now and harvest is needed to "size up." Final crop volume will be determined by sizing. Similarly, after the high summer daytime temperatures and more warm days forecasted in August, cool night temperatures are needed for coloring. The Champlain Valley was not significantly impacted by freeze events early in the year due to the later timing of bud growth.

East and Midwest

Pennsylvania projects 8.5 million bushels, significantly lower than the 2019 USDA final survey of 12.1 million bushels and the 5-year average of 11.9 million bushels, due to freeze events early in the year and potentially lower packout rates due to freeze-related finish issues. Similar issues factored into the Virginia forecast of 3.8 million bushels, 20% below the 5-year average of 4.7 million bushels. Michigan forecasts 22.5 million bushels of good quality, equivalent to the 2019 USDA final survey and 4.3 million bushels below the 5-year average.

West

Washington forecasts 176.2 million bushels, 9.3 million bushels higher than the 5-year average and 5.2 million bushels lower than the 2019 USDA final survey. Participants in the forecast from Washington were divided on the amount of fruit on the tree. The USDA August estimate is at the midpoint of the range and was left unchanged. However, the group felt it was likely that the amount of fruit brought to the fresh market would be lower than last year's 134m 40-lb packed boxes and packers would exercise more selectivity this year, potentially resulting in 125-130m 40-lb packed boxes. California forecasted 6.4 million bushels, 9% above the 5-year average, and Oregon forecasted 3.9 million bushels, equivalent to the 5-year average.

Implications for the 2020 Eastern NY Harvest

As was the case with the 2019 crop, there appears to be plenty of fruit of good quality in the state and across the country, implying that there will be a competitive market in general. In a competitive market it becomes more important to pick high quality fruit with high packout rates to be competitive and maximize returns. In addition, the analysis conducted by Matt Wells several years ago (Fruit Notes Vol 15 Issue 19, August 2015) still holds: Fruit that is held in storage as fresh, then culled from the packing line, and then diverted to process, will result in a very low return, a break-even return, or even a negative return, because of the costs associated with storing and packing fresh fruit. It is better for process fruit to be identified in the orchard and sent directly to process. For this reason, it is important to be in close contact with your packer to understand the particular quality packout criteria for an orchard block, and work closely with your pickers to ensure they are picking to those standards on that harvest day.

New How-To Video on Apple Maturity Testing for Long-Term Storage

Michael Basedow and Andy Galimberti, CCE Eastern NY Commercial Horticulture

Maturity Testing for Long-Term Storage Harvest Planning

Your apple harvest should be timed to provide the best quality fruit to your specified market. While fruit destined for immediate sales and eating can be picked for optimal color and flavor, fruit destined for long-term storage need to be picked while less mature, to prevent the fruit from being over-ripe when they reach the consumer.

To help determine when your blocks are ready to be harvested for long-term storage, there are a few maturity metrics you or an employee on your farm can test, including fruit firmness, brix, and the starch pattern index.

If you would like a brush up on the basics these tests, or would like to train some of your new employees, we have developed a short training video demonstrating how to perform these tests on the farm to help key in on your optimal harvest windows.

The video can be viewed on the ENYCHP YouTube channel at the following link: https://www.youtube.com/watch?v=V6WjbQ2v6w0

A chart showing some of the main long-term storage maturity parameters is available here.

New State Guidance for Agritourism Businesses—Hayrides are A-OK!

Elizabeth Higgins, CCE Eastern NY Commercial Horticulture

Governor Andrew M. Cuomo recently announced new state guidance for agritourism businesses as New York State enters the Fall season. The businesses, which include corn mazes, pick-your-own fruit and vegetable operations, hayrides and haunted houses, are considered low-risk outdoor arts and entertainment and are permitted to operate under New York's NY Forward guidance. New Yorkers can also visit the State's farmers' markets and craft beverage trails, which have remained open under State guidance, supporting agriculture and tourism in the state.

"New York State's amazing outdoor attractions and recreational opportunities are a boon for families and communities during the fall season each year, and we want New Yorkers to be able to enjoy this time with their family responsibly and safely," **Governor Cuomo said.** "The new guidance announced today will ensure that these businesses can open to the public, allowing families to enjoy their favorite fall activities while providing a boost for our farming communities and local economies."

State Agriculture Commissioner Richard A. Ball said, "As one of the nation's top agricultural states, New York traditionally comes together in the fall to celebrate the harvest—from apples to grapes to pumpkins. This year, while things may not look exactly the same on your favorite farm, I am happy to say we can still celebrate agriculture's bounty and the many family-friendly activities that go with it. With this new guidance, we hope New Yorkers will be able to enjoy some of the best of New York agriculture in a safe and socially distanced manner."

The businesses that can reopen are subject to Low Risk Outdoor Arts and Entertainment and Public Transportation guidance. Guidance includes, but is not limited to:

Corn Mazes - permitted consistent with Low Risk Outdoor Arts and Entertainment guidance and the following conditions:

- Reduced capacity
- Face coverings required
- Social distance maintained between individuals/parties

Hayrides - permitted consistent with Public Transportation guidance and the following conditions:

- Mandatory face coverings
- Social distance required between individuals/parties
- Frequently touched surfaces, such as handrails, cleaned and sanitized between rides

Pick-Your-Own Fruit/Vegetables Operations - permitted consistent with Low Risk Outdoor Arts and Entertainment guidance and the following conditions:

- Reduced capacity
- Face coverings required
- Social distance maintained between individuals/parties.

Haunted Houses - permitted consistent with Low Risk Indoor Arts and Entertainment guidance and the following conditions:

- Reduced capacity
- Face coverings required
- Social distance maintained between individuals/parties

Petting zoos are **not permitted**.

The Agritourism Facts and Frequently Asked Question document can be viewed at https://agriculture.ny.gov/system/files/documents/2020/09/agritourismfaq.pdf.

The New York State Department of Agriculture and Markets has issued a full slate of guidelines for the agricultural industry, including guidance for farmers' markets and for its food and beverage producers. All guidance can be found at https://agriculture.ny.gov/coronavirus.

Developing a Great Farm Website

Elizabeth Higgins, CCE Eastern NY Commercial Horticulture

COVID-19 has made having an online presence even more important to farms. Last winter I looked at fruit farms with PYO operations and found that a large number either did not have a website or had a very outdated website. Here are 8 elements that a great website should have, how does yours measure up?

1. A **clear goal** – what do you want people to know about your business when they come to your website? What purpose does this website serve? This information is what all other decisions about content are based on.
2. **Clear site navigation.** Any page on your website should not be more than two clicks away from the homepage. Make it really easy for visitors to find what they are looking for. I can't tell you how many websites have the business address and contact information buried.
3. The **homepage** is critical. This is your first impression.
4. A **clear call to action** – what do you want the visitors to do on your page? Are they buying product, making reservations, finding your location and hours? You are selling something so make it clear.
5. **Mobile friendly version.** Everything that is important on your website should be easily accessible to someone who is looking at it on their phone. Most modern website design services automatically convert websites into mobile friendly versions. If your computer and mobile versions are the same it is time to upgrade!
6. The **"about us" page**. I look at this page all the time. This is a chance to put your best foot forward and tell your story.
7. A way to **collect information about visitors** – both a way to collect actual contact information, as these are potential leads for marketing but also collect information about what pages people spend time on or don't spend time on. This will help you determine how effective your website is.
8. **Regular updating** – no clearly outdated information. I should have put this one higher. When I see a website that still has the 2013 price list or last year's schedule, I wonder if they are still in business.

On **October 13 at 12:30** I will be holding an informal zoom meeting where I will go over tips for improving farm websites. If you would like feedback on your farm website or an opportunity to learn more about making your farm's website more effective, the registration link is https://cornell.zoom.us/meeting/register/tJ0od-mgqD0pGNeiewXDw9fGgMrN2gVKPrn-. After registering, you will receive a confirmation email containing information about joining the meeting. Please register in advance. If you have specific questions prior to the session that you would like me to address, send me an email with your question and your website link to emh56@cornell.edu. If you cannot attend, but are interested, let me know and I will offer the program on alternative dates.

Design Your Succession Plan

"Empowering Families to Get Started on Their Succession Plan"

Online Zoom Series Coming to NYS in October

More than 80 percent of farm families hope to pass the family farm on to the next generation, but research shows only 30 percent of family farms survive to the second generation, and only 12 percent survive to the third generation. A successful transition to the next generation takes careful planning. **How will your family farm operate in the future when the owner retires or is gone? Are you currently working with another generation who may be questioning their role in the future of the farm, or are you yourself questioning your current role? Succession planning is a critical component of on-going business planning and it is never too soon to start.**

New York State farm families now can participate in ***Design Your Succession Plan,*** a newly designed program that provides the tools and resources to begin the farm succession planning process. This program is a working collaboration among Cornell Cooperative Extension, the Workforce Development Institute, and NY FarmNet. In NYS, the program will be offered as a four-evening remote course via Zoom in conjunction with an online learning platform used between meetings. The program will run from 6:30-8 p.m., October 8, 15, 22. and 29. For more information, contact your local CCE educator, information below, visit http://cceoneida.com/ or https://reg.cce.cornell.edu/dsp_230 to register online.

Participants will have an opportunity to open lines of communication with family to create a shared vision for the family business. They also will learn to choose and work with professional attorneys, accountants, lenders, insurance agents, and tax experts to construct a plan and documents that put the family's vision into action.

The program will prepare you to envision, communicate, plan, write, and shape the legacy of your family farm or ranch business, as well as save hundreds of dollars by completing these crucial planning steps before visiting with professionals.

This program is being offered via Zoom. The cost is $60 per farm family and includes a workbook valued at $20. Pre-registration is required. The registration deadline is Thursday, September 30 to ensure on-time delivery of the program workbook. For more information, contact Elizabeth Higgins at emh56@cornell.edu.

Best Management Practices for U-Pick Farms During the COVID-19 Pandemic

U-Pick is a critical direct marketing approach for many of our Eastern New York orchards and provides customers with a unique connection to fresh produce grown close to home. In light of what we understand about the spread of COVID-19, new management practices will be needed to protect your farm team and your customers. This document provides recommended practices and communication strategies for U-Pick operations for the 2020 season. https://smallfarms.cornell.edu/wp-content/uploads/2020/05/Cornell-U-Pick-Best-Practices-COVID-19.pdf

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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.

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