The Produce Pages

Serving the fruit and vegetable growers of Eastern New York

Farm Feature

December 2018

J&A Farm in Goshen, NY

Bringing Certified Naturally Grown Vegetable Production to the Black Dirt

Ethan Grundberg

Jeff and Adina Bialas of J&A Farm in Goshen, NY graciously agreed to be featured in this month's Produce Pages farm profile. Jeff grew up on the famous Black Dirt of Orange County and managed a farm for many years before making the decision to start an independent operation with Adina in April 2010. The couple brought with them a tremendous amount of experience in mixed vegetable production and marketing, but very little capital to invest in a new business. The two have managed to grow their farm from 7-acres of leased land in 2010 to 15-acres of muck soil (12 owned, 3 rented) today while distinguishing themselves as pioneers in adapting organic production methods to the unique challenges of the Black Dirt.

The Produce Pages

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Though a desire to develop a more sustainable farm model was a primary motivation for Jeff and Adina to start their own farm, the initial vision of J&A Farm did not necessarily include organic production methods. However, when Jeff sunk a plow into the ground in April 2010 and brought up "a ton of worms" that he had never seen on the other conventional farms he had managed, he immediately began to question some of the assumptions he had learned about how to grow vegetables. As the couple tells it, the decision to not spray pesticides for the first few months was not based on a production philosophy, but rather not having the resources to purchase inputs. "We had to buy our seed bit by bit over the year" as they generated enough income from markets to cover the bills. Jeff and Adina continued to observe how their crops developed on their new farm, started reading more about organic agriculture, and after a couple of months made a deliberate decision to avoid synthetic pesticides and pursue compliance with Certified Naturally Grown standards. It made more sense to them to be "farming organically working with nature instead of not organically and always trying to fight it."

Jeff and Adina have taken that approach of reinvesting income in the farm in an incremental fashion out of necessity in their first year and turned it into a foundational principle of the business. In 2011, the couple made the most of being completely flooded by Hurricane Irene by building a propagation greenhouse on high ground while their fields were under water. In 2012, the two erected a couple of high tunnels funded by the NRCS cost-share program, followed by building out a wash and pack area attached to their barn in 2013. Since then, the wash and pack has been slowly populated by an AZS rinse conveyer, improved plumbing, new harvest totes, and finally in 2018, the finishing touch of overhead lighting.

Part of J&A's success at growing the farm comes from the strong connection that they have built with their customer base. J&A started out by selling at two farmers' markets in the city and offering an on-farm CSA. Jeff leveraged many of the personal relationships that he had cultivated with customers while managing other farms to continue to build his reputation as a grower of top quality produce and purveyor of an enormous diversity of vegetables. "We grow over 400 varieties" of vegetables, herbs, small fruit, and pulses... not to mention the mix of cover crops used to help maintain soil health and reduce soil loss on fields very prone to wind and water erosion. While J&A Farm built its reputation among customers, Jeff and Adina had their perception among other Black Dirt farmers to polish. We were known as the farm "doing all of the weird stuff" by other farmers in the area. Other farmers would drive slowly by their fields and yell out questions like "what the hell are all of those white covers in the field for," but over time Jeff and Adina have gained their respect and acceptance by consistently demonstrating their success. "Everyone thinks you can't grow organically in the Black Dirt, but we've shown that you can do it successfully, profitably, with good weed control, and with good yield," Jeff stated.

Of course, any story about a newly established farm would be incomplete without recounting some of the many struggles faced by the business along the path to success. To begin, Jeff and Adina weren't able to tap into some of the programs that are now available to beginning farmers. "Now new farmers have a lot more resources; when we were starting in 2010 there was literally nothing." Without a long-term lease agreement available, they opted to apply for an FSA loan to purchase the land that they would farm. The couple was successful and closed on the farm in August of 2011, just a few weeks before Hurricane Irene wiped out everything in their fields. The farm persevered and continued to grow, but Jeff and Adina received life-altering news in December 2014: Adina was diagnosed with the incurable blood cancer multiple myeloma. The constant treatment that Adina endures for multiple myeloma has shrunk her ability to be involved on the

production side of their farm operation and has forced the couple to critically re-evaluate their priorities. “The farm was consuming too much of our lives and we needed to figure out a way to have a balance with it,” Jeff said. “If a crop can’t grow without me there [on the farm] on a Sunday, we can’t grow it.” Jeff and Adina made the decision to fight against the “workaholic nature” of farming and find ways to increase efficiencies and increase profitability without taking on more work.

Adina’s multiple myeloma diagnosis also shapes their vision of the future of the farm. Jeff and Adina are now selling at just one farmers’ market, have started selling to a local restaurant, and have revived the on-farm CSA that they had dropped while growing for two city markets. As Jeff noted above, the focus is not on growth, but gaining efficiency and improving the bottom line. Those are goals that most farms strive for, but the 2018 season on the Black Dirt made it challenging to make much progress toward attaining them. The extreme weather events, from microbursts in May to 7 weeks of drought followed by incessant rain and high humidity, reinforced the couple’s dedication to building soil health and embracing diversity in their production plans to enable the farm to better withstand the uncertainties of a changing climate. This year felt like “there was always something smacking you in the head” and fueled “that absolute frustration when you work twice as hard to make half as much because of factors out of your control.” Jeff and Adina are no strangers to adversity, though, and their ability to adapt to the challenges that they confront, find silver linings in their difficulties, and continue to laugh about Jeff’s ability to find ways to trade vegetables for beer goes a long way to explaining their success.

*All pictures used with permission of J&A Farm

ENYCHP has a new email address!

ENYCHP now has a new team email address. For any questions related to enrollment or other administrative needs, please contact enychp@cornell.edu. To talk to a specialist, just contact them directly as usual!

First to the Market

Amy Ivy

Direct market customers eagerly await the first veggies of the season. If a grower can beat their neighbor by even just a week or two they may well have a loyal customer for the rest of the season.

With this thought in mind, we ran a trial last summer to see if using a high tunnel would produce some warm season crops earlier than if grown outside. We also looked at whether using rowcover in both settings helped significantly. High tunnel space is considered 'valuable real estate' so growers rightly question whether taking up this space with a simple crop like beans or zucchini is worth it.

We held the trial at the Cornell Willsboro Research Farm in Essex county, with funding from the Northern NY Agricultural Development Program. The crops we trialed were bush green beans, zucchini and red bell peppers. The inside crops were planted in a 30x96' unheated, single layer high tunnel on April 23; one treatment had rowcover pulled over whenever the temperature was below 80 degrees and the other had no rowcover. The outside crops were planted on May 17 on black plastic. One treatment was uncovered and the other was completely covered until June 14 (4 weeks). The zucchini variety was 'Partenon' which is parthenocarpic so it does not need pollination. The zucchini and peppers were set out as transplants and the beans were direct sown as seeds.

The full report will be available later this winter and will be available on our website, but in the meantime here are our key findings:

Bush Beans

- Cool soil temperatures resulted in very poor germination, both inside and outside the tunnel. We had to replant the tunnel planting and still didn't get good germination.
- To really push this crop consider setting out transplants for the first harvest.
- The tunnel did provide the first harvest a full week before the field planting, so this might be worth it in certain markets and then the crop could be pulled to make room for a mid-summer crop like basil.
- The rowcover did not make a difference in yield or timing either inside or outside the tunnel.

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The tunnel on May 3 showing the covered and uncovered blocks. There were 4 replications of each treatment.

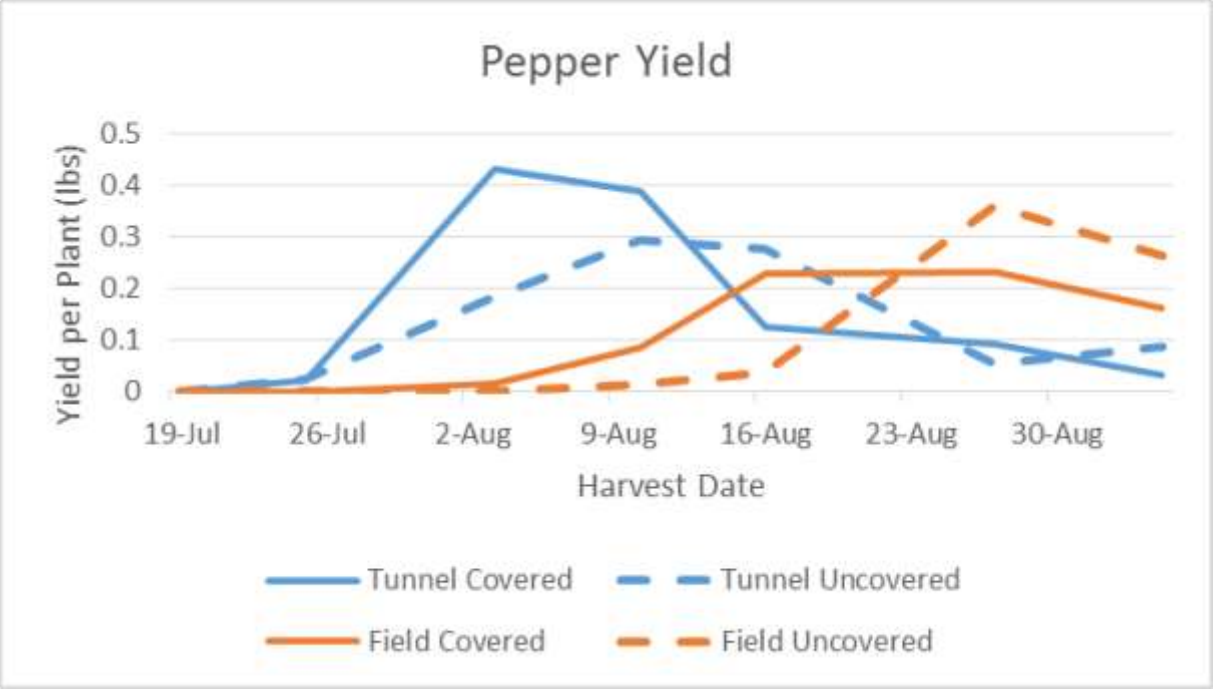
Zucchini

- The first tunnel harvest was 3 weeks before the first field harvest (May 23 in the tunnel, June 13 in the field).
- The rowcover in the tunnel and in the field gave only a slight improvement in earliness and yield, and good protection from early cucumber beetles, but this did not result in a statistical difference. The tunnel made a difference, but not the rowcover.
- By mid-June both locations had similar yields so in practice, the tunnel crop could be removed at this point to make room for a mid-summer crop like basil while the field plantings continue to produce.

Sweet Red Bell Peppers

- The plants inside the tunnel began yielding 2 weeks earlier than the outside plantings.
- There were many fewer culls from sunscald on the inside tunnel plantings.
- Rowcover only slightly increased yields on both plantings, but not significantly.
- The April 23 planting date into the unheated tunnel was too early. These warm season plants languished under the chilly temperatures from late April through June.
- A later planting date of mid to late May would be more appropriate in this northern location. Our 2017 pepper trial had a planting date of May 25 and the plants were much more robust than the 2018 plants that got off to a very slow start. Further study on optimum transplant dates in tunnels is needed.

In our trial sunscald was worse on the plants grown outside the tunnel than inside. Sunscald and blossom end rot can cause similar symptoms on peppers. Check where the damage is occurring while the fruit is still on the plant. For sunscald, the damage will be on the side facing the sun the most directly. Blossom end rot also appears on the sides of peppers, rather than centered on the bottom of the fruit as it does in tomatoes.



This chart shows that the tunnel plants began yielding 2 weeks before the field plantings and the covered plants had only slightly higher yields than the uncovered plants.

What do biofungicides add to vegetable disease management? Part 1 – Introducing the project

Amara Dunn, Sarah Pethybridge, Darcy Telenko

This summer we compared three biofungicides added to a conventional cucurbit powdery mildew management program in field trials conducted in western and eastern NY and on Long Island. Photo credit: Caitlin Vore, Cornell Vegetable Program

What we're doing

During the summer of 2018 Amara Dunn, the NYS IPM biological pest management specialist, worked with colleagues (Elizabeth Buck, Dr. Julie Kikkert, Dr. Margaret McGrath, Jud Reid, and Crystal Stewart) on a project funded by the New York Farm Viability Institute looking at the use of biofungicides (Remember what biofungicides are?) in vegetable disease management. Dr. Darcy Telenko (formerly of the Cornell Vegetable Program) helped plan the project before starting her new position at Purdue University, and Dr. Sarah Pethybridge provided valuable advice based on her extensive work with white mold (including control with biofungicides). BASF, Bayer, BioWorks, Certis, Dow, and Marrone BioInnovations provided product for the field trials.

The project has two goals:

1) Quantify what biofungicides add to management of cucurbit powdery mildew and white mold in terms of…

- disease control
- yield
- plant health
- economic value (comparing yield gains to fungicide costs)

2) Evaluate the utility of NDVI (normalized difference vegetation index) as a measure of plant health and disease detection in fresh vegetables.

Why this project?

For both diseases (cucurbit powdery mildew and white mold), we're considering biofungicides used with other pest management strategies – other biofungicides, conventional chemical fungicides, and/or cultural practices. Biofungicides are not expected to be silver bullets, and they work best when used in an IPM strategy. But when deciding whether or how to use them in your operation, it's good to know what value you're getting for the extra costs of purchasing and applying the products. This summer we ran trials in three major vegetable-producing regions of the state: western New York, eastern NY, and on Long Island.

Biofungicides for cucurbit powdery mildew

Cucurbit powdery mildew looks like a dusting of powdered sugar on the cucurbit leaf. These powdery spots start on the underside of the leaf, and then develop on the upper surface of the leaf, so excellent spray coverage is important. Photo credit: Amara Dunn, NYS IPM

For combatting cucurbit powdery mildew, we're comparing three biofungicides: LifeGard (*Bacillus mycoides* isolate J), Regalia (extract from the giant knotweed plant *Reynoutria sachalinensis*), and Serifel (*Bacillus amyloliquefaciens* MBI 600). All three were applied weekly starting when the plants were small. Then, when the first signs of powdery mildew showed up, we started a rotation of conventional fungicides (Vivando, Quintec, and Luna Experience). These three treatments plus a rotation of all-organic fungicides (LifeGard, MilStop, Serifel, and a mineral oil) are being compared to two control treatments: the conventional fungicides alone, and plants that received no treatment for powdery mildew. We ran the trials on a variety of bushing acorn squash ('Honey Bear') that has intermediate resistance to powdery mildew.

Biofungicides for white mold

In the white mold trial, we're looking at Double Nickel (*Bacillus amyloliquefaciens* strain D747) alone or in combination with Contans

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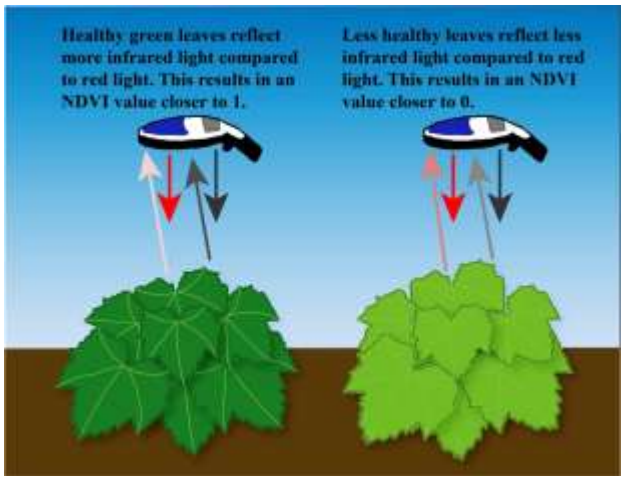
(*Paraconiothyrium minitans* strain CON/M/91-08; formerly *Coniothyrium minitans*). Next year we'll look at these biofungicides in combination with reduced tillage at one site. Reduced tillage is another IPM strategy for white mold. The active ingredient in Contans is a fungus that eats the resting structures (sclerotia) of the fungus that causes the disease white mold. Because of this, it needs time to work, and is applied either in fall or spring. The goal is to reduce the number of sclerotia present in the next crop. Next year we'll collect data on whether application of Contans reduced disease. In the meantime, during the 2018 growing season treatments we tested were Double Nickel, Cueva (an OMRI-approved copper) and no treatment for white mold on snap bean. Previous research by the EVADE Lab at Cornell AgriTech at The New York State Agricultural Experiment Station, Geneva, New York, has shown that Double Nickel is a promising biofungicide for white mold.

Most vegetable crops are susceptible to white mold, with legumes being among the most vulnerable. The name comes from the dense white "tufts" that the fungus forms. These develop into dark, hard sclerotia that can survive for years in the soil. Photo credit: Amara Dunn, NYS IPM

What is NDVI, anyway?

In a nutshell, the "normalized difference vegetation index" (NDVI) is a way to quantify how much healthy, green foliage is present. The device we used emits different types (wavelengths) of light (red and near infrared), and measures how much of each type of light is reflected back from the leaves of the plant. Leaves that are dark green and healthy reflect more infrared light and absorb a lot of red light. Less healthy leaves reflect less infrared light. A NDVI value closer to 1 indicates healthier plants. A NDVI value closer to 0 indicates less healthy plants (or more bare ground).

NDVI and similar indices are already used in other crops and in other places to help growers make decisions about when to fertilize, or to help detect parts of a field where a pest may be present. So far in NY, NDVI is not being widely used by fresh market vegetable growers for disease detection. Collecting NDVI data from this project will do two things:



NDVI (normalized difference vegetation index) quantifies the amount of dark green foliage based on how much light of different wavelengths is reflected. It is used in some crops to decide when to apply fertilizer, or to help detect below-ground pests. Photo credit: Amara Dunn, NYS IPM

1) Help us quantify the health of plants. Even though NDVI is not a measure of disease, we would expect to see more healthy foliage if biofungicides are contributing to disease control.

2) Provide some preliminary data to help us determine whether NDVI measurements could be useful to NY fresh vegetable growers.

Field meetings were held at each powdery mildew trial location so that local growers could see the trials and hear about the project. We're currently wrapping up data analysis from the 2018 field season. You'll be able to learn about results from the first year of this two-year project at winter meetings around NY, in extension newsletters, and on the IPM biocontrol blog. Also, stay tuned for Part 2 with details about how these biofungicides work (modes of action), and how to use them most effectively.

Growers and industry reps had a chance to visit the 2018 cucurbit powdery mildew field trials shortly before they were harvested. Photo credit: Amara Dunn, NYS IPM

What Happens from Véraison to Harvest?

Raquel Kallas & Tim Martinson

Link to Online Article: https://grapesandwine.cals.cornell.edu/newsletters/appellation-cornell/2018-newsletters/issue-34-august-2018/grapes-101/

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For vines, grape fruit are a vehicle to spread DNA so that they may perpetuate the species and colonize new locations. Co-evolution of grapes alongside birds and mammals has resulted in a mutually beneficial exchange. Animals receive a nutritious and delicious fruit snack as 'payment' for dispersing the digestion-resistant seeds within, and the seeds, effectively transported away from the parent vine, are conveniently deposited in fertilizer after passing through animals' guts. Charles Darwin said as much in the Origin of Species: "[fruits'] beauty serves merely as a guide to birds and beasts in order that the fruit may be devoured and the manured seeds disseminated."

Véraison heralds the start of the ripening process, which is brought about by the expression and repression of hundreds of thousands of genes. At this time, berries begin their transformation from hard, green, and bitter, with enamel-stripping acidity, to aromatic, sweet, attractively colored, and pleasantly acidic. The development of grapes from fertilized flowers to ripened fruit is a complex physical and chemical process. Here, we will focus on the final stage of development: the transition from véraison to ripeness.

The Three Stages of Berry Growth. The growth rate of a grape berry is the shape of a double sigmoid curve (Figure 1). This curve can be broken down into three stages of growth:

- Stage I, or the *cell division phase*, is when the berry undergoes rapid cell division, accumulates acids (primarily tartaric and malic), and ultimately achieves half of its final weight and size.
- Stage II, or the *lag phase* is when berry growth pauses, and the primary focus is on seed growth and chemical signaling to prepare the berry for softening and expansion in the next stage. The duration of the lag phase is variety-specific — varieties with long lag phases tend to be later ripening, while varieties with relatively shorter lag phases ripen earlier.
- Stage III, or véraison to harvest, is characterized by cell expansion in the berries and a transition from photosynthetic activity to heterotrophic metabolic activity as the berries change color at véraison. In other words, the berries go from being a partial "source" to a large "sink". This sets the stage for accumulation of sugars, proteins, anthocyanins, tannins, and flavor and aroma compounds, and metabolism of acids and an increase in pH. The entire process is brought about by the expression and repression of hundreds of thousands of genes. The changes during this time heavily influence the final quality and composition of the fruit at harvest.

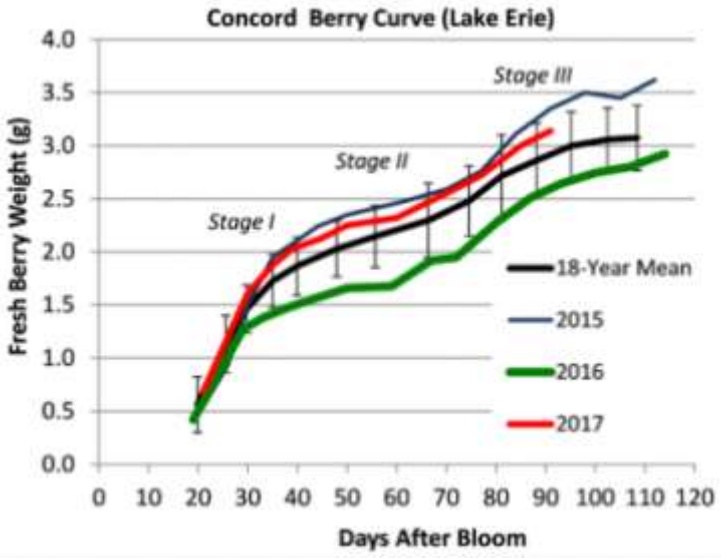

Figure 1. Berry growth curve for Concord grapes, showing the 'double sigmoid' curve encompassing three stages of growth (courtesy of Terry Bates)

So what are the changes that take place during the stage III transition from a green, bitter, acidic, unappetizing marble, to a sweet, soft, palatable, and delicious ripe berry?

Berries soften and skin becomes elastic. Softening of the pulp is due to disassembly of the mesocarp (pulp) cell walls, so that the walls are loose and able to expand. Positive turgor pressure drops more than tenfold before and during stage III, due to accumulation of sugars and other solutes, resulting in increased softness. Simultaneously, the elasticity of the skin increases in preparation for berry expansion. Additionally, the wax on the skin changes its composition to become more resistant to evaporation.

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Grapes at véraison. Photo credit: Tim Martinson.

Berries expand. Expansion is made possible due to the pulp softening and skin elasticity. Berry expansion is primarily driven by imports of water into the mesocarp vacuoles (storage compartments in the cell), which take up the vast majority of space in the cells at this stage. Water is the number one player in ripening, and a berry will be 75-80% water by the time of harvest, but less if over-ripened.

Sugar accumulates. At véraison, xylem flow into the berry drops off, and phloem becomes the primary transport avenue into the berry during stage III. The phloem brings in amino acids (for synthesis of phenolics) and carbon in the form of sucrose into the vacuoles. In most V. vinifera cultivars, sucrose is broken down and stored as glucose and fructose, while hybrids and natives retain some sucrose. The sugar accumulated during this time determines the resulting alcohol concentration in the wine.

Acid changes. pH increases and titratable acidity decreases during stage III. Together, tartaric and malic acids account for 90% of the acid in grapes. Tartaric acid is accumulated and synthesized by the berries at the start of stage I and ceases roughly halfway through. There is usually no loss of tartaric acid during stage III, but breakdown can occur at temperatures over 30° C. In contrast, significant quantities of malic acid are metabolized as a source of energy for the berry during stage III, with around 2-3 g/L left by harvest (more or less depending on environment and variety).

Phenolic compounds, including those that cause color change, are formed. Flavonoids, a group of polyphenols in grapes, are largely in flux during the ripening process. Within the flavonoids are 3 classes: flavonols, flavan-3-ols (tannins), and anthocyanins.

- *Flavonols* are found in the skin of grape berries where they act as sunscreen (quercetin is an example, and the most abundant flavonol in white grapes). Flavonol accumulation begins during the first part of the cell division phase (stage I), then generally pauses until after véraison (stage III). Flavonol concentrations are highest a few weeks after veraison.
- *Flavan-3-ols are tannins*, and their concentrations are highest in the seeds followed by the skins, while the pulp has only a small amount. The synthesis of tannins in the skins and seeds finishes during the first few weeks of stage III, and remains constant or decreases slightly until harvest. During this time, the seeds turn brown due to oxidation of tannins on the seed coat.
- *Anthocyanin synthesis occurs exclusively during stage III*. These red, purple, and blue-pigmented compounds are responsible for the various colors and hues in the skin (and the pulp in the case of teinturier varieties) of red grapes. Color change at véraison occurs due to the simultaneous breakdown of chlorophyll and accumulation of anthocyanins. Variety largely determines the types of anthocyanins present, while environmental factors during stage III influence the quantity. Environmental factors that affect anthocyanin quantities include temperature and light exposure, an increase of both being beneficial until a threshold when they become detrimental. For example, temperatures above 35-37° C have been found to diminish anthocyanin accumulation – this is not typically a concern for growers in the northeast US. White grapes do not produce anthocyanins; their

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change in color from opaque bright green to various translucent greens, yellows, and golds is due to the breakdown of chlorophyll and exposure of underlying carotenoids.

Flavor and aroma compounds and precursors develop. The saying "good wine is made in the vineyard" undoubtedly has its basis in the development of the flavor and aroma compounds and precursors in the fruit. All else equal, these are arguably the most important players in determining quality and expressing the typicity of a wine. Stage III is a critical time for some compounds, while the presence and abundance of others is not influenced during the ripening period.

- *Monoterpenes accumulate*. Monoterpenes, a group within the larger family of terpenes, are an example of a class of compounds that rapidly accumulate at the end of stage III. Notable monoterpenes that are characteristic of Muscat grape varieties include linalool and geraniol, which contribute coriander seed and rose aromas to the grapes and wines. Both free and glycosylated (bound to a sugar) monoterpenes have been observed to increase a few weeks after véraison, reaching their highest concentrations just as sugar accumulation slows or even past when it stops.
- *Methoxypyrazines decrease*. Green, herbaceous vegetable aromas in wines are caused by a group of compounds known as methoxypyrazines. It has been repeatedly demonstrated that methoxypyrazines, specifically the aromatically distinctive 2-methoxy-3-isobutylpyrazine (IBMP), accumulate from fruit set to bunch closure (stage I). After véraison, the concentration of IBMP decreases as berry maturity progresses, but the final concentration is correlated with the concentration that was accumulated during stage I. Therefore, IBMP at harvest is predetermined by the amount of light exposure in the fruiting zone during stage I (increased UV exposure decreases IBMP accumulation), and remains unaffected by any management techniques implemented after véraison.

Conclusion. Véraison to harvest is a time of elaborate changes within grape berries, while they become chemically and physically perfected to appeal to mobile seed dispersers like humans. Sugar, organic acids, polyphenols, aroma and flavor compounds, and berry size and softness are all in flux during stage III, and all contribute in some way to the final fruit quality and composition.

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Grapes at véraison. Photo credit: Tim Martinson.

The Scourge of Bitter Pit

Looking like a difficult storage year for Hudson Valley Honeycrisp Producers

Daniel J. Donahue

Reports are starting to filter in of excessive Honeycrisp cullage out of storage this season. The predominant defect reported is bitter pit, a surprise to some following observations that this season's crop appeared relatively clean at harvest. Our ENYCHP tree fruit team is currently in the 3rd year of our comprehensive Honeycrisp/Bitter Pit survey study, and our results to date shed some light on how 2018 compares to '16 and '17.

What is BP, and do we understand the cause?

BP is a dark sunken lesion on the surface of the apple, usually at the calyx end, that is a result of the desiccation and death of cells just under the peel. The condition is a physical disorder associated with low calcium in fruit tissue and is known to be influenced by soil and weather conditions, nutrient availability, tree age, vigor, crop load and fruit size (Ferguson and Watkins 1989, Rosenberger 2004, Freitas 2010). There is variation in the expression of the disorder by NYS region, by year, and from orchard to orchard. Unfortunately, science has not yet provided a clear understanding of causation, much less how to effectively mitigate the damage. Producers and researchers tend to view bitter pit the same way you and I might treat a vitamin deficiency. If your doctor says that you're deficient in a mineral, or vitamin, lets say magnesium as an example, the practitioner's recommendation might be to take a daily supplement and all will eventually come back into balance. Foliar calcium sprays applied throughout the summer follow the same logic, sort of like saying to the trees: "Take your vitamins!". Unfortunately, this strategy has been shown to produce inconsistent results in both research trials and commercial orchards. The problem may have something to do with calcium distribution and timing. The relatively immobile calcium ion can't reach the deficient tissue to help, and it may be too late anyway, the damage may well have been done much earlier in the growing season than we currently understand.

Honeycrisp, bitter pit, and real-world experience

The profitability of the Honeycrisp (HC) variety is critical to the continued growth of the New York apple industry. Current acreage has been estimated to be as high as 2000 acres, with many of those acres in the newly planted and early bearing stages (unfortunately, reliable survey data doesn't exist). As volume continues to grow, the need to successfully store and market the crop while maintaining currently strong pricing will become more critical. This is the crux of the problem for NYS producers, storing HC from our orchards is financially risky due to several potential storage disorders, the most devastating being bitter pit (BP).

Of the 700 apple producers in NYS, the majority grow some Honeycrisp, and most have trouble obtaining a 60% or better packout. In general, our team has found BP incidence is highest in the Hudson Valley, approximately 25% less in the Champlain Valley, with reports of WNY falling somewhere in between. With HC being one of the highest value varieties we produce in NYS, growers can expect an orchard run crop value of 20-30K per acre. With losses to BP running 6-47% by block, on average over the last three seasons (Donahue et. all unpublished), the cost to producers attributed to BP is enormous, potentially $1,200 to $14,100 per acre, or at minimum 2.4 million dollars a year (likely much higher) for the entire NYS apple industry.

A single spot is all that is required to cull an otherwise great quality fresh market apple into the juice bin with a value loss of 80%. Bitter pit symptoms observed at harvest, on the tree or in the bin, do not reliably reflect the incidence of the defect after two months of storage (see photo below).

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Hudson Valley, NY 2018: Example of bitter pit of Honeycrisp after 60 days refrigerated storage at 36F. At harvest, the apples in this tray did not exhibit any symptoms. Photo credit: D. J. Donahue

As shown in Figure 1, year is a significant variable in trying to predict how HC will behave in storage. In 2016, Hudson Valley HC BP was generally terrible at harvest, but didn't worsen appreciably after 60 days of refrigerated storage at 36F. The same blocks in 2017 behaved differently with a much lower incidence of BP observed at harvest, and a modest increase found after storage. Overall, producers considered the losses much more tolerable than those of the prior season. Data from the same blocks in 2018 tell a very different story. HC appeared clean at harvest, but in storage the "hammer fell" and fruit coming out looked as bad as the 2016 crop did when it was going in.

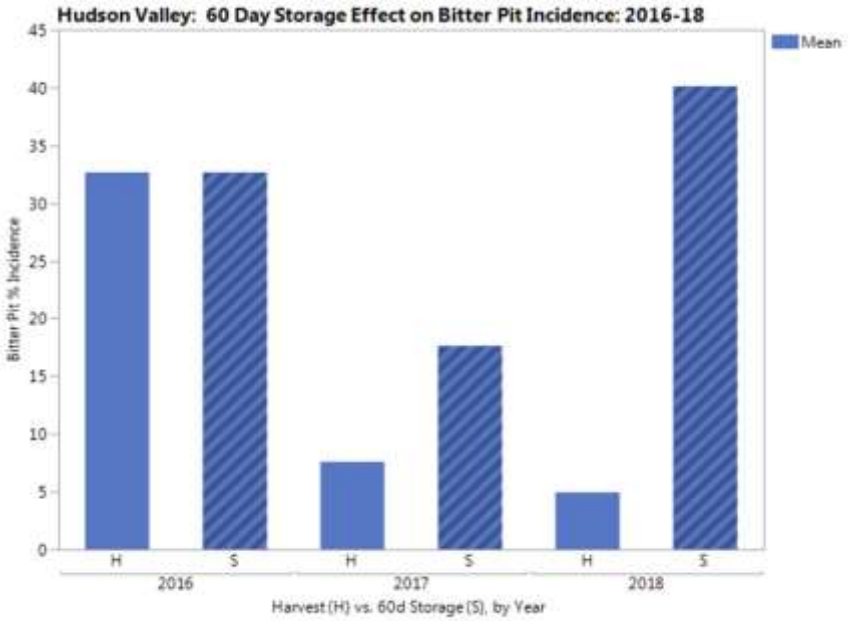

Figure 1. When bitter pit symptoms express, and how much the expression worsens in refrigerated storage, varies from season to season. In 2018, fruit going into storage appeared clean, even better than 2017. After 60 days, the data tells a much bleaker story.

Our conclusion is that we cannot predict BP based on prior season observations. Variation between blocks, as represented below in Figure 2, is a well-recognized phenomenon with producers recognizing certain blocks as historically poor BP performers. However, our data indicates (not shown) that even blocks will vary substantially from year to year.

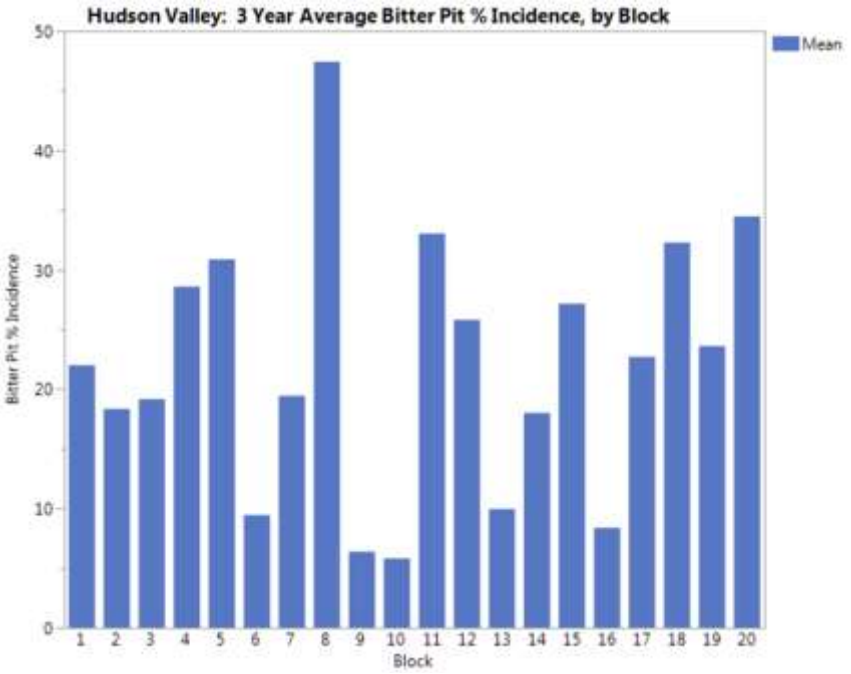

Figure 2. Bitter pit incidence in Honeycrisp varies substantially between blocks, 5.8 – 47.4% in the case of the 20 blocks followed in this three-year study.

What we've recently learned through research:

Separate research groups at Cornell, Donahue et. al. and Watkins et. al. have been funded over the last three years by the NYS Apple Research and Development Program to pursue HC BP prediction strategies. Donahue et. al. has developed a pre-harvest peel mineral analysis model based on our 2016/2017 survey data with an R-square predictive value of 0.53 when tested against an independent validation data set. Work is currently underway to analyze the 2018 data set and further improve the accuracy of the model, incorporating factors for Prohex-pink application, regionality, and rootstock classification. This prediction protocol requires the producer to sample 12 apples per block five weeks prior to expected first harvest, peel them using a spiral peeler (same as you would use to peel apples for baking), and send the calyx half of the sample to the Cornell Nutrition Analysis Laboratory for mineral content testing.

An easy-to-use spreadsheet interface is under development that would calculate a BP prediction in terms of a recommendation: Ok to store, risky to store, do not store.

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The Watkins et. al. group has successfully built a BP prediction model based on a simple "passive" method where the producer picks 100 apples 3 weeks pre-harvest, allows them to sit at room temperature, then rates BP incidence just prior to first harvest. The model does not require the producer to spend money on lab analysis, but it does require a significant labor commitment to pick, store, and evaluate the boxes of fruit sampled. The R-square of the model after 3 years of development is 0.66.

What's next?

Bitter pit prediction technology in NYS as reached a point in development where it should be introduced for testing by commercial producers. Plan on attending the 2019 Cornell Cooperative Extension Eastern New York Commercial Horticulture Fruit and Vegetable Conference, February 19-21 at the Desmond Hotel and Conference Center in Colonie, NY to learn more about our plans to introduce these two new HC BP prediction protocols. Considering the high potential for big $$$ losses, spending a little time and money to identify problem blocks and keep them out of storage will pay off by improving your bottom line.

Recent references: All NYS apple producers receive a copy of the Fruit Quarterly. Please take the time to review three recent articles:

Bitter Pit Mitigation and the Honeycrisp Apple: Prohexadione-calcium and Bourse Pinching Effects on Bitter Pit, Shoot Extension, and Fruit Size. Donahue, D. J. et. al. 2018. Fruit Quarterly 26-3, pp. 23-28.

Non-Mineral Prediction of Bitter Pit in Honeycrisp Apples. Al Shoffe, Y. et. al. 2018. Fruit Quarterly 26-2, pp. 21-23.

Why is Honeycrisp so Susceptible to Bitter Pit? Cheng, L. and M. Miranda Sazo. 2018. Fruit Quarterly 26-1, pp. 19-23.

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New Farmers Grant Fund Accepting Applications from Early-Stage Farmers

Empire State Development (ESD) and the New York State Department of Agriculture and Markets today announced $1 million in funding is available to assist early-stage farmers through the New York State New Farmers Grant Fund. The program, now in its fifth year, promotes growth and development in the state's agriculture industry. To date, $3.27 million has been awarded to nearly 90 farms throughout New York State to expand their operations and improve their profitability.

The $1 million New Farmers Grant Fund will provide grants of up to $50,000 to assist with up to 50 percent of eligible project costs. To qualify, all farm business owners must be within the first ten years of having an ownership interest in any farm business, and the farm must have a minimum of $10,000 in income from sales of products grown or raised on the farm. Eligible project costs include the purchase of machinery, equipment, supplies, and the construction or improvement of agricultural structures.

Applications and guidelines for the New Farmers Grant Fund are available at https://esd.ny.gov/new-farmers-grant-fund-program. The deadline for submission is January 25, 2019.

Questions should be sent to Bonnie Devine at: nyfarmfund@esd.ny.gov.

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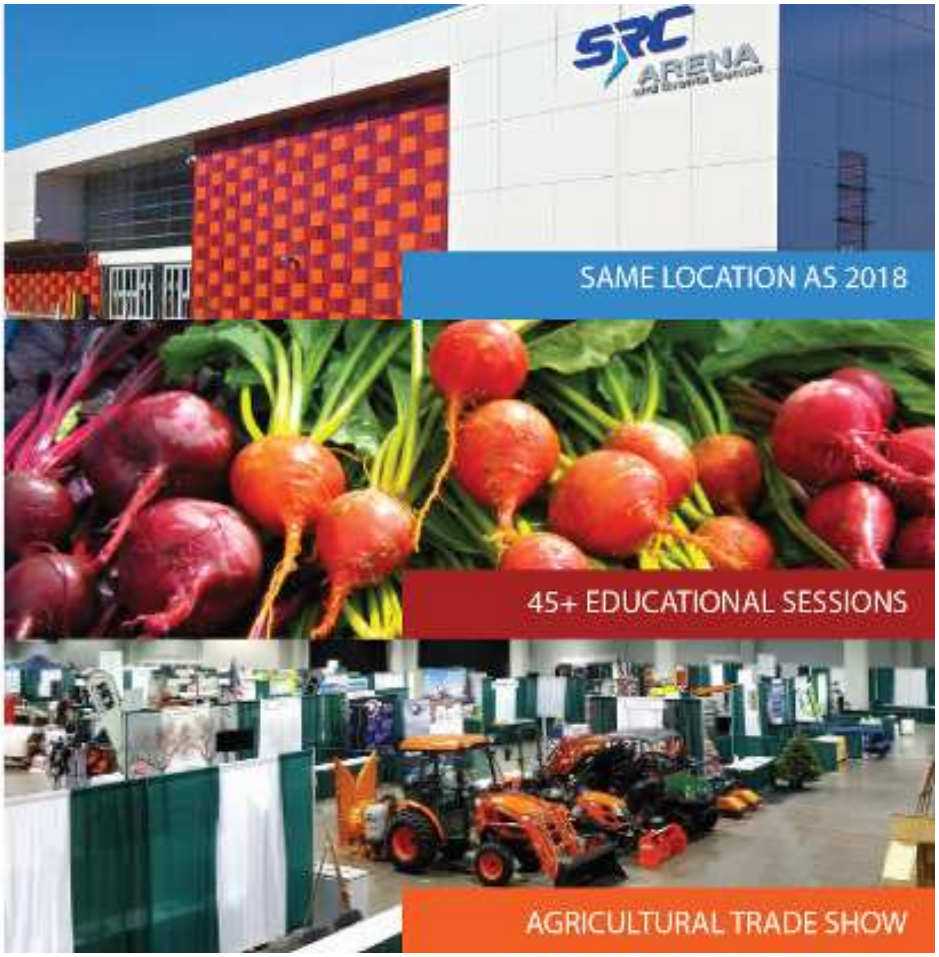

ANNIE'S PROJECT

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Sponsored by

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4-part series designed for women who are farm owners or farm managers, or who anticipate moving into a decision making position on a farm

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November 19—Building Financial Skills—Learn financial management tools. Topics: farm financial statements; crop insurance; tools for business planning; effective use of loans and credit.

December 10—Managing Your Land and Farm Infrastructure—Learn about managing land and infrastructure. Topics: leasing and owning land; assessing farmland quality; choosing infrastructure; farm taxes; other insurance and risk management tools for your farm.

January 7—Managing Your Business, Employees and Planning for Transition—Learn about managing people and planning for the future. Topics: hiring and training employees; conflict management; transition planning.

To register: tinyurl.com/2018-Annies-Project

For more information: Carrie Ann Doyle, CCE Ulster County cad266@cornell.edu or (845) 340-3990

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Cornell Cooperative Extension
Eastern NY Commercial Horticulture Program

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Join us for the 2nd Annual Eastern NY Fruit and Vegetable Conference! This year we will be expanding our conference to include a third day and many exciting new sessions. Speakers, topic details, and registration information will be available soon. Mark your calendars, and don't miss this great line-up!

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Desmond Conference Center
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Sessions will include:

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- Everyone Needs a Voice: Building Great Employee Relations
- Worker Care: Let's Get Ahead of Our Customers and Regulators
- Why H2A Participation is Growing, Even in Dairy

Calendar of Events

See the ENYCHP Website to register for further information, or to register for many of these programs
http://enych.cce.cornell.edu/events.php