The Produce Pages

Serving the fruit and vegetable growers of Eastern New York

Farm Feature

November 2018

Tangleroot Farm, Essex NY by Amy Ivy

For this month's farm profile we go to the northern end of eastern NY to the town of Essex, in Essex County to visit Tangleroot Farm owned by Adam Reed and Susan Cerny. They started the farm 6 years ago near Saratoga but moved to Essex 4 years ago. Their farm is about 50 miles from the Canadian border, 125 miles north of Albany and just a couple of miles from Lake Champlain. Here they began with an acre of beautiful loamy sand soil and have expanded that to over two acres in cultivation now. They started with a couple of small high tunnels and caterpillar tunnels and now have 16,000 square feet under plastic including a large high tunnel and, by next spring, a multi-bay tunnel.

They have kept their Glens Falls and Saratoga area farmers markets connections and sell about 75% of the produce there. The other 25% is sold in Essex County at local stores like The Village Meat Market in Willsboro and through The Hub on the Hill in Essex. They have just over 100 CSA members in similar proportions.

Susan Cerny and Adam Reed of Tangleroot Farm

Cornell Cooperative Extension | Eastern NY Commercial Horticulture Program

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The *Produce Pages* is a monthly publication of the Eastern New York Commercial Horticulture Program. For more information about the program, please visit our website at http://enych.cce.cornell.edu/.

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Serving the Educational and Research Needs of the Commercial Small Fruit, Vegetable and Tree Fruit Industries in Albany, Clinton, Columbia, Dutchess, Essex, Fulton, Greene, Montgomery, Orange, Putnam, Rensselaer, Saratoga, Schoharie, Schenectady, Ulster, Warren and Washington Counties

Adam and Susan grow some of everything to meet the demands of the fresh market and CSA customers. They became certified organic in 2017 and grow intensively with careful spacing, trellising and rotations. The crops they have fine-tuned and focus on the most are the most are salad mixes including lettuce, spinach, arugula, mesclun, baby kale and microgreens. Sales at the local stores and markets have responded well to their move to clamshell packaging where the product is easy to see and protected from damage to the tender leaves. They also credit having their logo professionally designed and printed to increased sales and customer loyalty.

Overhead irrigation worked very well during this past dry summer. Essex County did not receive the soaking rains the rest of our region got and remained dry through September.

I have enjoyed watching them expand their acreage and increase their production and efficiencies these past four years – they have made impressive progress! Some new things they've tried and liked include more tarping as weed control and soil preparation and reduce tillage, and fine-tuning their small scale, moveable irrigation systems. They are also paying more attention to soil health, fertility monitoring and variety selection.

When I asked what challenges they see in the coming years Adam mentioned balancing productivity and labor. He has been moving to more intensive systems but these require more skilled labor, such as training cucumbers, peppers and tomatoes to single or double leader systems in the tunnels, trellising some field crops and careful timing and harvest windows. Skilled, experienced labor is difficult to find and retain from year to year.

Lastly, I asked Adam what advice he would give to new growers. He said to start off really small. First work for someone who knows what they're doing for at least a couple of years. In the first year you learn ***what*** to do, and in the second year you learn ***why*** things are done in a certain way, once you have the context of the farm operation. Then once you're on your own, start small and build from there.

Their professionally designed logo and clamshell containers have increased sales and customer loyalty, and maintained product quality.

Adam leads CSA members on a tour of the farm on a Farm Dinner night

Turn Up the Heat? Impact of Minimal Supplemental Heating on Winter High Tunnel Greens Production

Ethan Grundberg

With support from a Northeast Sustainable Agriculture Research and Education program (NE SARE) Partnership Grant (ONE17-298) and the generous cooperation of the Poughkeepsie Farm Project (PFP), I spent much of last winter gathering data from a side by side comparative trial assessing the impact of minimal heating in winter greens production. Specifically, we tracked yield, soil nitrate availability, total plant nitrogen uptake, propane use, and soil temperature all winter in the two identical side-by-side 42'x196' double layer inflated poly Harnois high tunnels at PFP. The only deliberately manipulated variable between the two tunnels was the minimum thermostat setting: one tunnel was set to 33° F ambient air temperature and the other set to 40° F.

You may ask, prior to considering the differences observed between the two temperature thresholds, why heat at all? There seems to be little agreement among winter greens growers regarding the true costs and potential value of using supplemental heat all winter. For the PFP, much of the decision to heat the tunnels is informed by the fact that no one lives on site, so using row covers inside of high tunnels for additional protection is not feasible. Additionally, using supplemental heat allows the PFP to grow more tender, but more efficient to harvest and higher value crops like Salanova lettuces throughout the winter instead of just the hardier winter greens. Using supplemental heat also provides the PFP with greater flexibility in timing harvests to meet market demand; there is no waiting around until the afternoon for crops to thaw. Finally, given the sheer size of the tunnels at PFP and high quality double layered and inflated plastic covers, the thought was that the size of the thermal sink combined with the improved insulation would make heating more economical than it might be in a smaller, less well insulated set up.

So, clearly, heating at all won't make infrastructural sense to all winter greens growers. However, here are some of the observations that came from the trials at PFP during the winter of 2017-18.

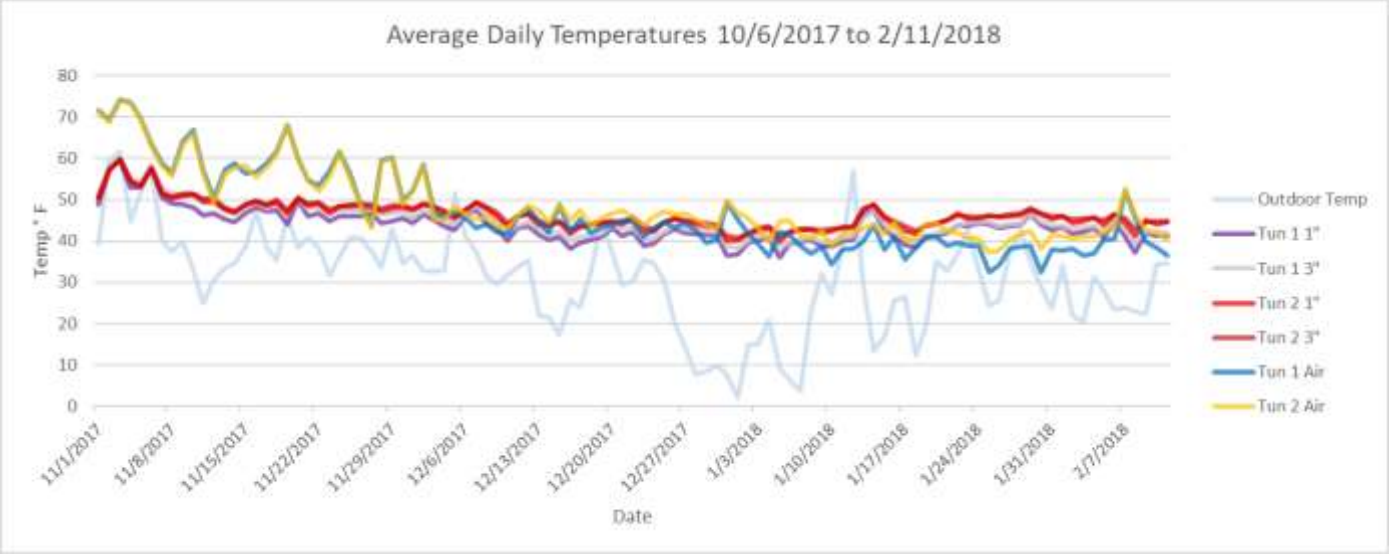
Temperature

Tunnel 1 had the thermostat set to 33° F and Tunnel 2 had the thermostat set to 40° F. Both tunnels were set to begin incrementally opening their ridge vents at 60° F. Temperature sensors were situated in the tunnels at approximately 2" above ground level for inside air temperature recording. Each tunnel also had two soil temperature data loggers, one buried at 1" depth and one at 3" depth, in the planted beds. The table below shows the average temperatures recorded from each sensor for the period beginning October 6, 2017 and ending February 11, 2018.

For the more visually inclined, here is a graph of the daily temperature averages for all of the sensors plus the outside air temperature.

Admittedly, that is a lot of temperature data to try to make sense of. Here are some salient observations for me:

1. Temperatures inside of both tunnels did not fall low enough to trigger the heating systems to fire up until



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	Outside Air Temp	Tunnel 1 Air Temp	Tunnel 2 Air Temp	Tunnel 1 Soil Temp (1")	Tunnel 2 Soil Temp (1")	Tunnel 1 Soil Temp (3")	Tunnel 2 Soil Temp (3")
AVG	36.44° F	45.71° F	47.48° F	47.64° F	49.51° F	48.95° F	49.94° F
Max Temp	81° F 10/8/2017 3:00 PM	86.1° F 10/10/2017 2:00 PM	85.3° F 10/10/2017 2:00 PM	81.5° F 10/10/2017 2:00 PM	82.4° F 10/10/2017 2:00 PM	80.6° F 10/10/2017 4:00 PM	77.0° F 10/10/2017 3:00 PM
Min Temp	-13° F 1/7/2018 7:00 AM	25.5° F 1/5/2018 5:00 PM	23.4° F 1/6/2018 4:00 PM	33.8° F (multiple early Jan)	36.5° F (multiple early Jan)	35.6° F (multiple early Jan)	37.4° F 1/1/2018 8:00 AM

the week of November 13th. In fact, temperatures mostly remained above both thermostat thresholds until the beginning of December 2017.

2. Neither tunnel's heating system (two propane-fueled overhead Modine 93 high efficiency heaters per tunnel) was able to keep up with the bitter cold, overcast skies, and high wind of early January as temperatures inside both Tunnel 1 and Tunnel 2 plummeted into the 20s.
3. As expected, soil temperatures at both depths were much steadier over time compared to air temperatures. For most of the winter, soil temperatures at the same depth in Tunnel 1 and Tunnel 2 did not vary more than 3° F despite much larger air temperature differences.
4. Setting the ridge vents to begin opening at 60° F definitely helped to regulate large temperature swings and keep humidity down. However, that same venting also very likely decreased temperature differences that may have otherwise been observed between the two tunnels.

<u>Nitrogen Availability and Uptake</u>

Soil nitrate availability tests were conducted every week through the winter. Plant tissue samples were submitted to Waters Agricultural Laboratories every other week through the winter for nutrient analysis. What lessons were learned from these data collected?

1. As we always preach, nitrogen is so dynamic it is difficult to capture in snapshot tests. This is true even in the winter months when the soil microbes that drive the nitrogen cycle slow down. Soil nitrate levels were not significantly or consistently different between the two tunnels.

2. More than just temperature influences nitrogen availability. Maintaining adequate soil moisture and, ideally, living roots in the high tunnel before planting is necessary to preserve the soil microbial community that makes nitrogen available for plant uptake.

3. Based on the plant tissue nutrient analyses, fertilizing to 70 pounds/acre of nitrogen in September provided sufficient nitrogen to kale, spinach, and Salanova until mid-February in both of the tunnels.

4. Targeted early spring fertigations with soluble Chilean nitrate carried those crops to maturity in early April (notice the quick response in total nitrogen content of leaf tissue after a February 15th fertigation of the equivalent of about 6.25 pounds nitrogen/acre). Planning to fertigate with soluble plant available nitrate in the late winter/early spring is likely a far more sustainable and responsible

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Lettuce powdery mildew at the PFP

Botrytis crown rot of lettuce at the PFP

nutrient management plan for high tunnels than overcompensating for slowed nitrogen release with higher levels of front-loaded nitrogen.

Yield

Thanks to the diligence and cooperation of the entire crew at PFP, yield from sub-plots of curly kale, spinach, and lettuce within each tunnel were recorded throughout the winter. Unfortunately, the yield data is not particularly useful for analysis because of the incremental nature of the harvest (cut for order only, not the entire plot at a time) and because of serious disease pressure in the plots. Specifically, both lettuce and brassica powdery mildew decreased marketable yield unevenly between the tunnels and across varieties. More significantly, botrytis crown rot (*Botrytis cinerea*) of lettuce caused a serious decline in yield, especially after the first cut of Salanova. The botrytis crown rot was far more severe in Tunnel 1, likely because the tunnel had been used to grow tomatoes during the summer and had experienced a moderate level of botrytis ghost spot (also caused by *Botrytis cinerea*), giving the pathogen population an opportunity to grow year round.

That said, there was one important observation made between the two tunnels. The warmer tunnel (Tunnel 2) yielded three lettuce harvests in the same time that the cooler tunnel (Tunnel 1) yielded only two. Depending upon how much Salanova lettuce a grower may plant in a tunnel and what the market value for that lettuce is, it could make financial sense to heat to 40° F instead of 33° F for the added yield from a third cut of lettuce.

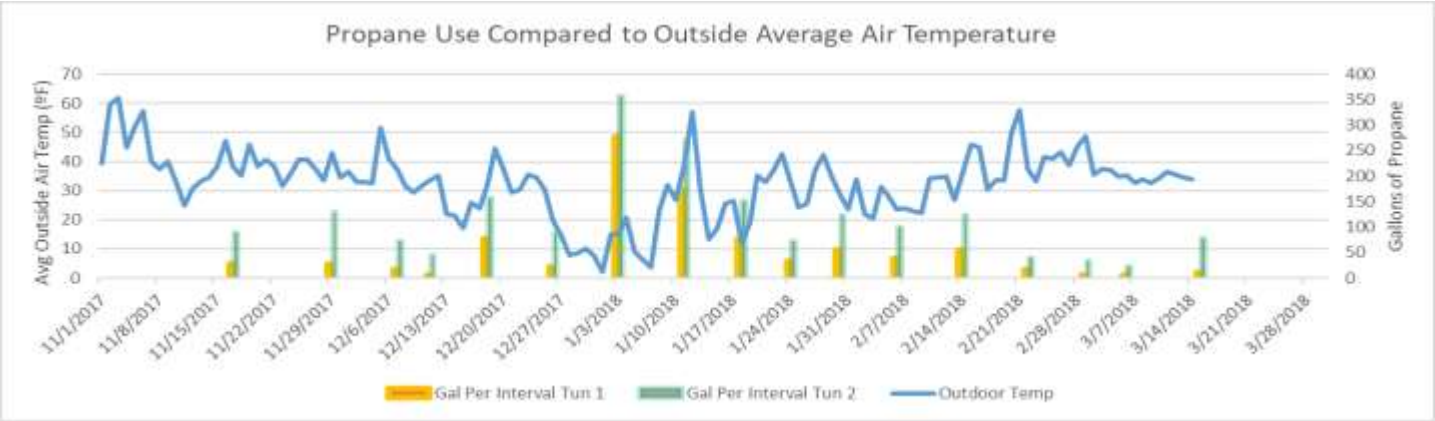
Propane Use

There is no real surprise here: heating a tunnel to 40° F uses a lot more propane than heating a tunnel to 33° F. It took 979 gallons of propane to heat the tunnel to 33° F from November through March. It took 2.1 times as much propane to add the extra 7 degrees to reach 40° F over the same period. Also not particularly surprising, the difference in propane use between the two tunnels was highest when outside air temperatures were in the mid-30s (thus resulting in the heaters in Tunnel 2 being activated, but not in Tunnel 1 with the thermostat set to 33° F). The following graph shows the total propane use in each tunnel for the previous week period on the bar graph compared to the average daily outdoor air temperature plotted as the blue line on the graph.

Need for Further Research

As is often the case with one-year trials, this study raised many more questions than it answered. First, if we had access to a research tunnel with supplemental heating and could sufficiently control pest and disease pressure, would we be able to replicate the observed yield difference in Salanova lettuce again? Would yield differences be more significant in kale and spinach under such conditions than they were at the PFP? What would be the potential impact of increasing temperature for shorter time intervals during the winter to push faster return growth on lettuce? Could analyzing impacts at more temperature thresholds, especially one just below freezing, help to narrow in on critical temperature thresholds to influence plant metabolic processes as well as nutrient availability? What is the interaction between heat and pests and diseases common in winter tunnel production? What is the ideal source and quantity of pre-plant nitrogen to apply for different greens crops and how does that change with supplemental heating? We are in the process of seeking more funding with the hopes of answering some of these questions in the future.

For now, though, feel free to contact me at eg572@cornell.edu if you have questions regarding the outcomes from the trial at PFP or if you'd like to be involved in some smaller group facilitated farmer-to-farmer meetings on high tunnel management this winter.



Identifying Diseases of Carrots

Susan B. Scheufele, UMass Extension

Carrots are becoming an more important crop for many growers, as folks look to increase winter sales in expanding year-round markets. Carrots can be affected by many bacteria, fungi and nematodes in the field and in storage. Foliar diseases may cause lower yields due to loss of photosynthetic ability, difficulty in harvest if the tops are weakened, and lower marketability if the carrots cannot be sold in bunches. Root diseases can lower yields of fresh eating carrots and can spread in storage, drastically reducing yields sold through later markets. Root diseases are caused by soil-dwelling organisms and therefore their incidence may vary considerably from farm to farm or even from one side of the field to the other. Proper disease identification will help you to prevent future outbreaks by adjusting crop rotations accordingly, and prevent moving infested soil from field to field. Some of the major carrot disease symptoms are described below. If you are noticing foliar or root symptoms like those described, send a sample to your state diagnostic lab to confirm, and take steps to protect current and future crops. See the UMass Diagnostic Lab website for their sample submission instructions.

To avoid losses in storage, try to achieve optimum storage conditions of 32 to 34°F (essential to minimize decay and sprouting during storage) and high relative humidity (required to prevent desiccation and loss of crispness). Mature topped carrots can be stored for 7 to 9 months at 32°F with 98 to 100% RH. Those ideal conditions are difficult to achieve and topped carrots are often successfully stored for 5 to 6 months at 32 to 41°F with 90 to 95% RH. Prompt cooling of harvested carrots (< 41°F) also helps maintain crispiness. Carrots produce very little ethylene (a byproduct of respiration) themselves but are sensitive to ethylene produced by other crops in storage and exposure causes production of the bitter compound isocoumarin, which is greatest in the peel—peeled carrots are not affected. Unless outside temperatures are very low or very high, ventilation is an inexpensive method of reducing ethylene levels. Ethylene can also be absorbed on commercially available potassium permanganate pellets.

Alternaria Leaf Blight (*Alternaria dauci* and *A. radicina*) symptoms first appear along leaflet margins as greenish-brown, water-soaked lesions which enlarge, turn brown to black, and often develop a yellow halo. Older leaves are more susceptible to infection. When about 40% of the leaf is infected, the leaf yellows, collapses, and dies. Lesions on petioles are also common and can quickly kill entire leaves. *A. radicina* can also produce a dry, mealy, black decay known as black rot on carrot roots held in storage.

Bacterial Leaf Blight (*Xanthomonas campestris* pv. *carotae*) symptoms appear primarily on leaf margins as small, yellow, angular leaf spots which expand, turn brown to black with a yellow halo, and become dry and brittle. Leaflets may become distorted and curled. Symptoms can extend into petioles where they produce a yellow-brown, gummy exudate, and may also occur on flower stalks. Infected umbels can be completely blighted and seed infection can occur—use treated seed to prevent introducing this disease.

Root Knot Nematode (*Meloidagyne hapla*) forms galls or root thickenings of various sizes and shapes. Growth of infected carrots is patchy and uneven and severely infected carrots exhibit forking, galls, excessive hairiness, and stubby roots. When soil populations of *M. hapla* are high, symptoms include stunted plants, uneven stands, premature leaf death, and branches and swellings on both lateral and tap roots. Marketable yield is reduced by deformities, size reduction, branches, and knobs. *M. hapla* persists in the soil and has a very wide host range so rotation can be difficult, but grasses are non-hosts so small grains and corn as well as resistant varieties of tomato and bean can be grown in rotations to reduce the size of the population.

Black Root Rot (*Thielaviopsis basicola*) occurs primarily in storage when conditions are not ideal and temperature and humidity are too high. The

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fungus causes superficial, irregular black lesions which occur in a random pattern. The discoloration, caused by masses of dark brown to black chlamydospores, is limited to the skin. The pathogen rapidly invades wounded tissue and is favored by long post-harvest periods without cooling, so careful harvest and immediate cooling (< 41°F) and storage can minimize disease impact.

White Mold (*Sclerotinia sclerotiorum*) affects many vegetable crops but carrots are particularly susceptible, especially late in the season and during storage. The fungus may be present in soil, storage areas, or containers. Symptoms include characteristic white mycelial growth and hard, black sclerotia (long-term survival structures), which may be seen on the crown of infected carrots. In storage, the disease is characterized by a soft, watery rot with fluffy white mycelia and black sclerotia present. Sclerotia can persist in soil for many years and the fungus has a very wide host range, making this disease difficult to manage. Grasses and onions are non-hosts that can be used in rotations, and a commercially available biocontrol product, Contans, has been shown to be effective in parasitizing overwintering sclerotia. Contans should be incorporated into infested soils in the fall to give the biocontrol fungus time to infect the sclerotia.

Cavity Spot and Root Dieback (*Pythium* spp.). Infections from *Pythium* spp. can occur during early root development and are favored by moist soil conditions. Root dieback symptoms appear as rusty-brown lateral root formation, or forking and stunting; symptoms that can be easily confused with damage from nematodes, soil compaction or soil drainage problems. Cavity spot often shows up later in the season near harvest. Horizontal, sunken lesions varying in size from 1 to 10 mm appear on the surface of the root and can provide an ingress for secondary fungal or bacterial infections.

Crown Rot (*Rhizoctonia carotae*). Early symptoms are horizontal dark brown lesions around the root crown. As the crop matures the tops may die in patches in the field and as the disease progresses lesions join to form large, deep, rotten areas on the crown of the root. *R. carotae* can also cause crater rot and violet root rot, but these diseases are less common in MA. Crown rot is favored by moist conditions, so planting on raised beds and/or in well-drained fields can minimize disease incidence.

Scab (*Streptomyces* spp.) can cause both raised and sunken, dry, corky lesions on the carrot root. This disease is less common and when it does occur symptoms are rarely severe enough to cause major losses in yield or marketability. Avoid planting carrots in alkaline soils, which are known to favor the incidence of scab, or in potato fields with high incidence of scab, as the disease can be caused by the same organism in carrots.

Bacterial soft rot (*Pectobacterium carotovorum* ssp. *carotovorum)* is a common disease in storage where it infects roots that previously wounded or diseased. It occurs in the field only rarely, under extremely wet soil conditions. Symptoms start as small water-soaked lesions that quickly spread and cause affected areas to become mushy, though the skin may remain intact over the liquefied flesh underneath. To avoid problems in storage, avoid wounding carrots during harvest and washing and maintain proper temperature (32-34□) and humidity (90-100%) for storage.

Evaluation of the use of two full rates of Retain on Preharvest Drop and Fruit Quality of Honeycrisp at Harvest and Following a Period of Cold Storage, 2017

Duane W. Greene and James Krupa

Stockbridge School of Agriculture, University of Massachusetts Amherst

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Three of the most popular apples grown in the New England are McIntosh, Honeycrisp, and Gala, but unfortunately the time of ripening of these is nearly identical. Two other popular varieties, Macoun and Cortland, ripen very soon after. Delay in normal harvest of any of these varieties due to difficulties in harvest management can result in the harvest of poor quality fruit that have reduced storage potential. Based on recent experience and success using high rates of ReTain we have shown that we can use two full rates of ReTain (two 333 g pouches/acre) on McIntosh and Cortland to improve overall quality of late-harvested fruit, and in the case of McIntosh achieving effective control of preharvest drop.

Honeycrisp and Gala are two varieties that have national importance and consequently the demand for these varieties is increasing. These two varieties also are relatively low ethylene emitters and as a result lower rates of ReTain (1/3 to 1/2 of a pouch) are generally used to minimize the delay in red color development. ReTain is used primarily on Honeycrisp to delay preharvest drop, whereas it is applied to Gala to slow ripening and reduce stem-end cracking.

Last year we did a non-replicated experiment with both Gala and Honeycrisp, where we treated with a split application of two full rates of ReTain in late August and early September. Fruit were harvested on Columbus Day, at the end of the second weekend in October. The fruit quality was very good and we concluded based on the quality of fruit that this approach to handling these varieties was very positive and had potential. The delay in red color development did not appear to be a problem at harvest. Observations made over the past 5 to 6 years has been that using high rates of ReTain (one application of 2 pouches or two split applications of 1 pouch each time) slows down maturity and allows apples to ripen later in the season, when the weather is invariably more favorable for red color development. The additional time on the tree also improves the eating quality of these later harvested fruit.

In 2017 we decided to do a full evaluation, using two full rate applications of ReTain (2 pouches/acre) on Honeycrisp, and evaluate fruit quality periodically from the time Honeycrisp are normally harvested until Columbus Day. We were also concerned about the postharvest potential of fruit harvested at the end of the second week in October. Once harvested, how long would it be possible to store the fruit and still have high quality fruit to sell? Was the fruit still saleable? A concern was that late harvested Honeycrisp are more prone to develop soft scald in storage than fruit harvested early. Therefore, harvested fruit were conditioned by keeping them at room temperature (60° F) for 5 days prior to placing them in air storage at 32° F. All remaining fruit on the treated trees and the control trees were harvested, placed in air storage and evaluated after 6 weeks and 13 weeks.

Materials & Methods

In a block of 8-year-old Honeycrisp/M.9, 10 groups of trees containing two to three contiguous trees were selected and marked. These groups were further paired by crop load and proximity in the row into 5 blocks (replications) containing 2 groups of trees. Within each replication one group was randomly chosen to serve as the untreated control where no ReTain spray was applied and the second group of trees was sprayed twice with ReTain, first on August 21 and again on September 7 with one pouch of ReTain (333g) per acre applied using a commercial airblast sprayer at the TRV volume of 100 gal/acre. Silwet L-77 was included in the tank at a rate of 0.05% (v/v). One tree in each block was designated as the drop tree, and no fruit were harvested from that tree during the experiment. One tree in each block was designated as the sample tree and all fruit were harvested from that tree. On September 5 all dropped fruit were picked up under the drop trees and then twice weekly, fruit were picked up, counted, and recorded until the experiment was terminated in October. At the end of the experiment all fruit were harvested from the drop trees and counted to allow a calculation of the cumulative drop.

A 15 apple sample was harvested from each sample tree on Sept. 15, 25, Oct. 5 and 12. Fruit were taken to the lab where they were subjected to a standard fruit quality

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evaluation. They were weighed and the surface red color was estimated to the nearest 10%. The internal ethylene was determined on a 10 fruit subsample by extracting a 1 ml gas sample from the core of each apple and injecting it into a gas chromatograph. Internal ethylene was measured and recorded with the aid of a digital integrator. The percent climacteric fruit was determined by noting the number of fruit in the sample that had an internal ethylene content of 1 ppm or more. Flesh firmness was taken on these fruit by making 2 punctures on each apple with a pressure tester using an 11 mm head. Juice collected during the firmness test was measured for soluble solids contents using a digital refractometer. Fruit were then cut at the equator and dipped in an iodine solution and evaluated using the Cornell Generic Starch chart using a scale of 1 (immature) to 8 (over mature).

One bushel of fruit was harvested from each block and placed at room temperature for 5 days. Following this conditioning period all fruit were placed in air storage at 32° F for later evaluation. On November 20, 6 weeks after fruit were placed in storage, fruit were evaluated for storage disorders and then returned to the storage. Fruit were again removed from storage on January 4, 13 weeks after being placed in storage. At this time fruit were pressure tested as previously described. The remaining fruit in each box were reevaluated for development of storage disorders.

Results and Discussion

Honeycrisp is a variety that can have severe preharvest drop problems in some years. Results in this experiment showed convincingly that preharvest drop can be controlled with the two applications of ReTain well into October (Figure 1). At the end of the experiment (October 12), cumulative drop on ReTain-treated trees was 11.8 percent, whereas cumulative drop on the control trees was 45.6%. The 2017 season was not a severe drop year for Honeycrisp. However, these data show that by using the high rates of ReTain, losses due to preharvest drop can be held to a minimum through periods where preharvest drop is often severe during the last half of September. These data also confirm observations made over many years, which is that if preharvest drop can be controlled until later in the fall, environmental factors change, resulting in less drop. The ReTain certainly did control drop during the heavy drop period from Sept 15 to Sept 28, a

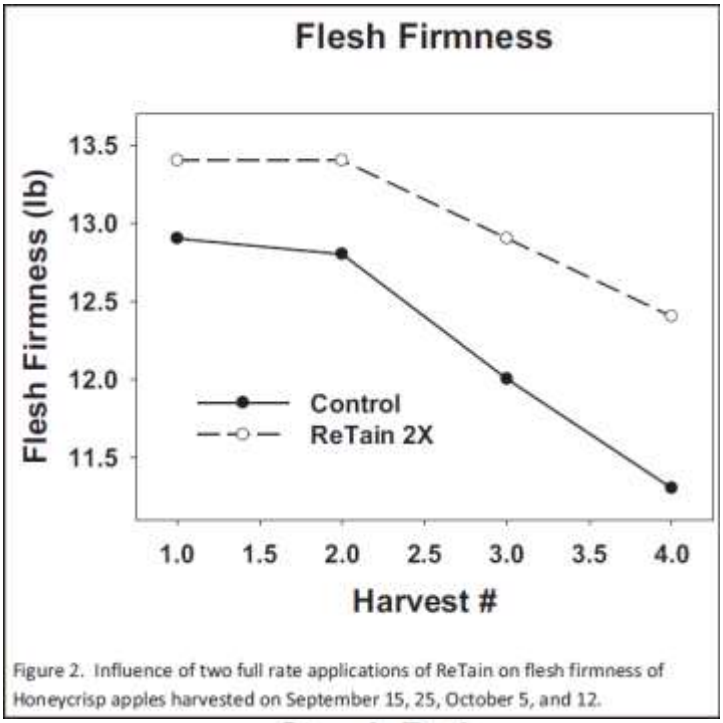

Figure 2. Influence of two full rate applications of ReTain on flesh firmness of Honeycrisp apples harvested on September 15, 25, October 5, and 12.

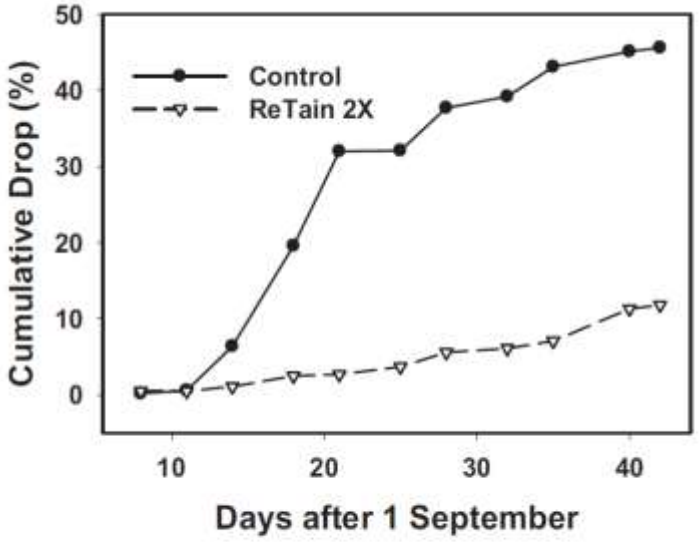

Figure 1. Influence of two full rates of ReTain (two 333g pouches/acre) on preharvest drop of Honeycrisp apples.

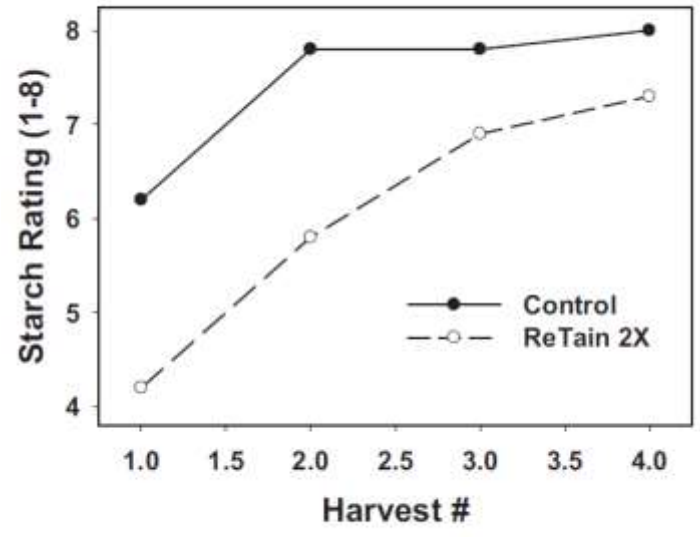

Figure 3. Influence two full rate appllications of ReTain on the starch content of apples using the the Cornelll Gebneric Satrch chart, 1=immature 8=over mature.

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Table 1. Influence of two full rates (2 pouches/acre) ReTain on fruit quality of Honeycrisp at harvest, 2017.

Treatment[1]	Weight (g)	Red color (%)	Firmness (lb)	Soluble solids (%)	Starch rating (1-8)	Climacteric (%)
	Mean 4 harvests (9/15, 9/25, 10/5, 10/12)					
Control	224	77	12.5	12.1	7.4	88
ReTain	234	63	13.3	11.9	6.1	15
Significance[2]						
ReTain (R)	NS	*	**	NS	***	***
Harvest (H)	***	***	***	***	***	**
R x H	NS	NS	NS	NS	***	**

[1]One pouch (333g) ReTain was applied at a TRV dilute rate of 100 gal/acre on August 21 and September 7.

[2]***,**,*,NSSignificant at P = 0.001, 00.1, 0.05 or nonsignificant.

period of time when preharvest drop can be substantial. Even though the check fruit were ripe, based upon the climacteric data, they did not drop in October at the rate they did earlier. The degree of drop control demonstrated in this experiment should provide growers with piece-of-mind during September when drop can be severe.

Fruit quality information collected over the course of the experiment is illustrated in Table 2. The data shown for each parameter represents the mean of the four harvest dates and the ANOVA includes all harvests dates. With the exception of fruit weight, ReTain significantly influenced all parameters evaluated. Flesh firmness is significantly affected both by ReTain and harvest date. We have not evaluated Honeycrisp over such a long period and we are surprised at the seemingly fast rate of decline of firmness with time, especially in October (Figure 2). ReTain delayed the loss of firmness of Honeycrisp. If one compares the firmness of control fruit on Sept 15 and ReTain treated fruit in October, they are essentially identical.

The extent of starch degradation in the harvested fruit is a measure frequently used to assess the stage of ripening of fruit. If one compares the starch rating of control fruit on September 15 with ReTain treated fruit in October, the starch rating of treated fruit is lower, 7.8 vs 6.9 and 7.3 (Figure 3). An alternative method to assess the stage of ripening, and one that is often considered more definitive, is to measure internal ethylene. Fruit with 1 ppm internal ethylene are frequently considered climacteric (Figure 4). Fruit treated with ReTain have a similar percent of climacteric fruit on the last harvest date as control fruit had on the first harvest date. These data present a very compelling case to suggest that the stage of ripening of ReTain-treated fruit in October (Oct 12) is comparable to fruit quality of untreated Honeycrisp at the initial (normal) harvest time on Sept. 15.

An objective of this experiment was to determine if quality Honeycrisp with acceptable red color could be harvested in October. If one compares the percent red color of the untreated fruit on September 15 with the color of treated fruit on October 5 and 12 the red color is similar if not identical (Figure 5). If one compares red color development of the ReTain treated fruit with control fruit at similar stages of maturity, it clearly shows that ReTain does not decrease red color, but rather these fruit have a very similar amount of red color when one compares red color at comparable stages of maturity. In October, treated fruit did have very good color, and thus we conclude that a reduction in red color development would not be a problem in October on Honeycrisp treated with high rates of ReTain.

Although no taste evaluation was done in this investigation, we did taste the fruit. Honeycrisp harvested in October were different, both treated and untreated. Honeycrisp is normally characterized at harvest as having noticeable acidity. Although not measured, late harvested Honeycrisp appeared to

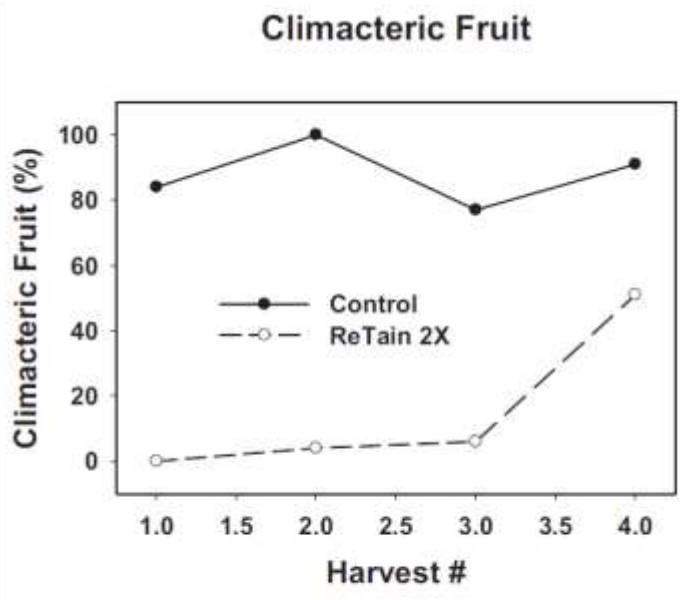

Figure 4. Influence of two full rate applications of ReTain on the percent of fruit that have 1 ppm ethylene internal ethylene (percent climacteric fruit) in Honeycrisp apples harvested on September 15, 25, October 5, and 12.

continued on next page

have a reduced acidity level compared with untreated fruit harvested on September 15. Several tasters commented on this. The treated Honeycrisp had excellent quality with good taste and attractive appearance. We considered these were the best Honeycrisp harvested on the farm in 2017.

Table 2. Influence of two full rates (2 pouches/acre) ReTain on storage disorders following 6 or 13 weeks in regular air storage, 2017.

Treatment[1]	Firmness (lbs)	Soft scald (%)	Bitter pit (%)	Rot (%)	Cracking (%)	Lenticel breakdown
			6-weeks storage			
Control	-----	0.3	0.3	4.9	26.9	1.4
ReTain	-----	6.0	0.0	1.4	7.5	1.1
Significance[2]		NS	NS	**	***	NS
			13 weeks storage			
Control	10.3	2.1	0.6	13.6	31.8	3.8
ReTain	12.3	21.1	0.3	3.0	10.5	2.6
Significance[2]	*	**	NS	**	***	NS

[1]One pouch (333g) ReTain was applied at a TRV dilute rate of 100 gal/acre on August 21 and September 7.

[2]***, **, *, NS Significant at P = 0.001, 0.01, 0.05 or nonsignificant.

Initial observations were made after 6 weeks in storage (Table 2). Fruit quality of ReTain-treated fruit after 6 weeks in storage was considered acceptable (Table 3). There was a small but statistically nonsignificant amount of soft scald and fruit cracking on treated fruit. Treated fruit were of acceptable quality and we could say that the treated fruit could be kept safely in storage for 6 weeks (until Thanksgiving). Untreated control fruit were starting to show rot and significant cracking, and we considered the quality of these fruit to be marginal at best. A second evaluation of stored fruit was made after 13 weeks in storage. Flesh firmness of treated fruit was deemed unacceptable (10.3 lb). However, they showed a significant increase in soft scald, and an increasing amount of skin cracking. The increase in soft scald was not expected due to the fact that maturity was delayed relative to the untreated control. This observation must be checked in the future. As was observed in the earlier storage evaluation, control fruit were not of acceptable quality at the time of evaluation, with a large amount of skin cracking and increased fruit rot. Fruit looked "old" and the fruit taste, firmness, and texture were unacceptable.

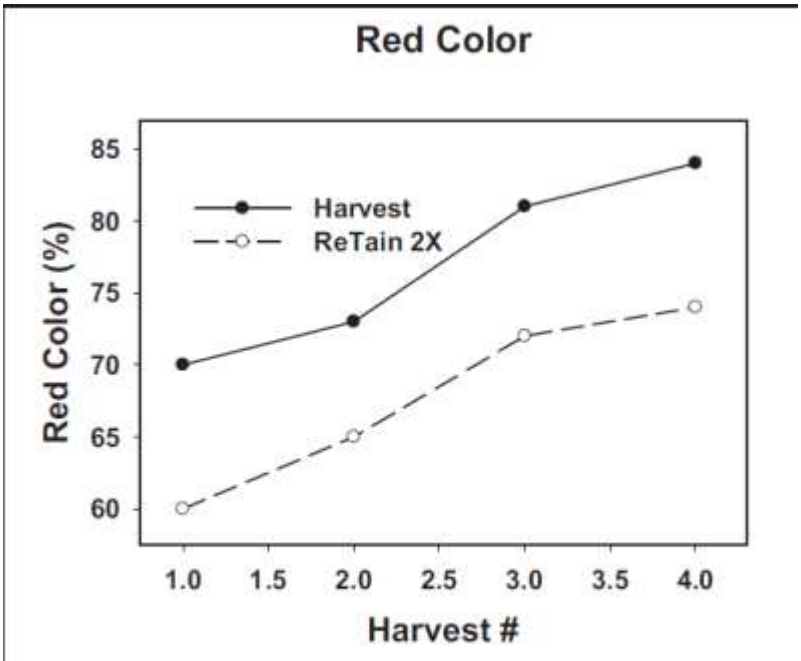

Figure 5. Influence of two full rate applications of ReTain on the percent surface red color of on Honeycrisp apples harvested on September 15, 25, October 5, and 12.

Summary

The results of this investigation demonstrated quite clearly that the use of 2 pouches of Retain per acre (666 g total) is a viable option for growers who wish to delay harvest of Honeycrisp until October. First, growers who wish to have quality Honeycrisp on the tree into October for the pick-your-own customers, and second as a vehicle to manage harvest when too many fruit of different varieties ripen at the same time.

ReTain treated fruit in October had nearly identical quality, if not identical quality, as untreated Honeycrisp that were harvested during the normal harvest period on 15 September. If a grower wishes to manage harvest by deferring harvest of Honeycrisp until October, then this option appears to be an attractive one. The drop control into October was excellent and fruit quality was comparable to fruit harvested on untreated trees earlier. If a grower chooses this option, it is our suggestion that these fruit should not be put in long term storage.

Overwintering Strawberries – Understand timing of fall mulch application and spring removal for best success

By Laura McDermott

Successful overwintering of strawberries is a tricky business and not giving it enough consideration can result in poor yield the following year.

Strawberries are perennial, and like most perennial plants they begin to go dormant as day length diminishes and cold temperatures set in. During this period of cold acclimation the plants are still very active – in fact this is when the fruit buds are being developed for the following seasons' crop. You will see changes in the appearance of the berry plants as cold acclimation advances. Leaf development stops, the leaf petioles become horizontal, and the plant appears to flatten out, and older leaves turn red.

The challenge with cold acclimation is that plants don't become 'hardy' until cold acclimation is completed. Hardiness is effectively reached when freezing temperatures exist for 2-3 days – so not just night minimums but a good hard cold spell. Ideally that cold would continue for the duration of the winter. Hardiness allows plants to resist low temperature damage. Strawberry plant hardiness – or ability to resist cold damage – continues to increase as the days get shorter. Photosynthesis is also required for cold acclimation to occur, so plants which are mulched before these environmental conditions have been met will not be fully winter-hardy. Strawberry plants are not as tolerant of cold temperatures as other perennial fruit crops even when fully acclimated. Variation in production systems like raised, plastic mulched beds further complicates a seemingly easy task.

Cold injury appears in the spring as either fully dead plants or more likely, very weak plants. The crown tissue browns. Temperatures in the single digits can kill crown tissue, but even temps in the mid-teens can cause fewer flowers and fruit, if those temperatures occur while tissue is in a non-dormant phase.

This is where mulch comes in. Mulch mimics snow –

A round bale buster being loaded prior to straw mulch application at Hand Melon Farm, Greenwich, NY

continued on next page

which is a great insulator against cold. Mulch prevents crown desiccation from wind, moderates soil temperatures and prevents freeze-thaw cycles that can damage plant roots and lift crowns out of the soil. Research suggests that using soil temperature as your timing guide is the best way to plan for mulch application. When soil temperature drops to 40°F or below, after three hard freezes, apply mulch. This usually happens between mid-November and mid-December. Mulch should be applied at 2.5 to 3.5 tons per acre and should be an evenly distributed depth of 2 to 3" thick after it settles.

What type of straw? Straws from wheat, oats, rice or Sudan grass can be used – just be sure the straw is free from weed seeds and don't use straw that was treated with glyphosate at harvest as strawberry plant injury has been reported when the straw was treated close to the date it was baled. Straws coarser than Sudan grass and hay are not recommended as they tend to mat down and trap water during the winter which can damage strawberry crowns. Strawberry growers can produce their own straw, often cutting the straw before the grain seed is viable. If grain seedlings become a weed problem, apply sethoxydim in the spring.

Strawberry field with heavy overwintering row cover. Note rocks that are weighing down the overlapping edges of cover.

Raised beds complicate things. Raised beds can be at least 5°F colder than flat beds, but mulching overcomes most of this negative effect. An additional challenge is that the berry cultivars grown in raised beds are sometimes not as winter hardy as traditional June bearing varieties.

There are two methods that have proven successful for growers using raised beds covered black plastic mulch. Floating row covers, like the heavyweight Typar 518 (1.25 oz/yd2 or 42 g/m2) can be used instead of straw. Row covers should be applied on a calm day using the same soil temperature guides as with straw mulch. The edges should be anchored with rocks or sand bags and then covered with soil to prevent the fabric from becoming a sail during the winter. Many growers have reported that the combination of black plastic lined beds, with a floating row cover, provides adequate winter protection, even in

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Lighter weight row cover over strawberries that have been successfully overwintered with straw mulch at Stanton's Feura Farm. The mulch has been raked back and the rowcover applied to provide frost protection when blossoms appear.

colder regions of the northeastern USA.

The second method requires straw mulch applied at a heavier rate than in a flat field situation. It's important to provide enough straw that if it slides off the top of the bed into the row alleys that there is still some straw left to protect the crowns. The rate will vary with the height of the beds, but usually it requires a minimum of 4 tons per acre of straw in a raised bed system.

Many growers are experimenting with combining straw and row covers, or using double layers of row covers. Whatever the method you choose – make sure that you are timing the application properly by using soil temperature as your guide.

Proper timing of mulch removal is critical. This past spring, the weather was cold and cloudy for most of March and into April. The concern over bloom protection in frost events (admittedly the worst job in farming) led growers to keep mulch on berry plants far too long resulting in many poor looking berry plantings. Keep in mind that unlike deciduous perennials, strawberries still have leaves during their dormancy. That results in a very low level of respiration that occurs even during the winter – but as air and soil temperatures warm, and day length increases – the plants move out of dormancy and start growing. They have received sufficient chilling and they are ready to go!

For overall success, growers should remove mulch when soil temperatures reach 40 degrees, or they should plan to do it by early April in our region. Leaving mulch on the plant well into April results in crown rot and starved plants that don't bounce back in time for harvest. This situation is one reason why growers have moved to using row covers for mulching. Row covers allow some light and the plants can start growing a bit earlier than they might with a heavy straw cover. Straw mulch can be raked off by hand or modified hay rakes have been specifically designed for the purpose.

What about fertilizing plants after mulch is removed? If plants look very stressed, or have obvious winter injury or lots of deer browse, a light fertilizer application might be appropriate. Research results indicate that Nitrogen rates above 30 lbs/acre applied in the spring will push plant growth at the expense of fruit production. Calcium nitrate is absorbed well in cold soil situations, and potassium will be pulled up through the plant as it transpires. Nitrogen rates ranging from 5-15 lbs of actual N per acre have been seen as appropriate at this early stage.

Other factors that impact overwintering success include deer browse and diseased plants. Autumn deer browse is a serious problem in our region. Deer fencing is the only consistently effective way to insure that deer don't get into your strawberries. Applying mulch earlier than required is not a good way to minimize deer browse.

Strawberry plants with serious leaf spot infections have been shown to have significantly poorer bud development in the fall and thus lower yield in the spring. There is some indication that these plants are more susceptible to winter injury compounding the loss the following year.

Sexual Harassment Prevention Law

As a quick reminder, all New York employers are required to have a sexual harassment prevention policy in force as of October 9, 2018. That policy must be available in a language that employees can understand. Employers must provide training on sexual harassment prevention for all employees by October 9, 2019.

The New York State Department of Labor released translations of the model sexual harassment prevention policy and training. You will find it in Spanish, Haitian-Creole and five other languages.

The state also added some tools to the sexual harassment prevention page for employers. You will now find there training presentations and case studies in both Adobe PDF format and Microsoft PowerPoint. These tools are meant to assist employers in their training efforts.

Use these helpful links:

New York's website for sexual harassment prevention model policy and training: https://www.ny.gov/combating-sexual-harassment-workplace/employers

Link for the translations in Spanish, Haitian-Creole, and 5 other languages: https://www.ny.gov/combating-sexual-harassment-workplace/combat-harassment-translations

Cornell Cooperative Extension

Eastern NY Commercial Horticulture Program

2018 Program Highlights

Modernizing Communication- This year ENYCHP has taken several steps to make our information easily accessible to growers. Our recorded webinars and podcasts (soon to be released) allow growers to learn at a time and place that is convenient to them. 16 videos are also now available to growers on our YouTube station and team social media accounts.

In addition we piloted a text messaging system that notifies growers in an instant of the most important alerts in our region. This season 8 pest alerts or business management reminders were sent from our specialists.

In February 2018, ENYCHP hosted the first Eastern NY Fruit and Vegetable Conference in Albany NY. This two day event averaged 300 attendees per day and offered programing on Tree Fruit, Vegetable, and Berry production, as well as Business Management topics. 93% of people surveyed said that they would attend again, and 99% said the conference was well worth the trip!

In it's second year, ENYCHP is expanding the conference to three days to include a general session, more in-depth programing, as well as grape production. This year's conference will return to the Desmond Conference Center on February 19th—21st, 2019.

ENYCHP Research continues in 2018. With 23 grant funded projects across all commodities, our specialists continue to work on the concerns that are most important to our region's growers. Research results and insights were presented during 250 hours of programming and trainings with 3750 growers in attendance.

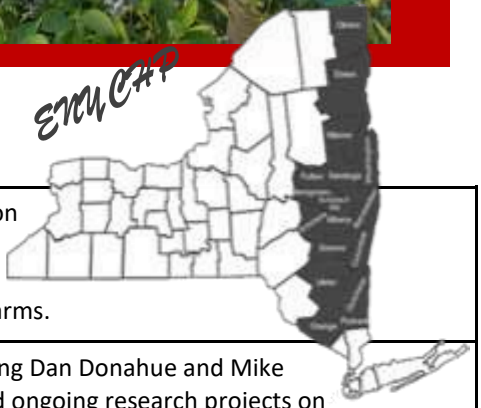
Our applied research is conducted on local private farms, as well as collaborating organizations such as the Hudson Valley Farm Hub, Cornell Willsboro Research Farm, and the Cornell Hudson Valley Lab.






2018 Grower Concerns

ENYCHP Team Response



Labor Issues	Liz Higgins, ENYCHP Business Management Specialist, hosted in person Ag Labor Management classes throughout our region and created 9 recorded webinars. Her soon to be released podcast series on business topics will provide a full complement of resources to local farms.
Tree Fruit Production	Tree fruit production is a huge part of the Eastern NY economy keeping Dan Donahue and Mike Basedow busy with an impressive series of educational meetings and ongoing research projects on topics that include Bitter Pit, Precision Management and Tree Decline.
Reduced Tillage and Cover Crops	700 acres of Asian Kabocha squash is being grown in the lower Hudson Valley and sustainable soil management practices especially for muck soils are needed. Ethan Grundberg and Chuck Bornt are looking for solutions.
BioControls	Crystal Stewart has been comparing the efficacy of biological fungicides at a number of farms in the region. Another type of biocontrol uses native nematodes that help control all kinds of difficult to manage soil insect pests. Teresa Rusinek & Chuck Bornt are using them to control wireworms in sweet and Irish potatoes.
Innovations in Farming Systems	Farmers are using high tunnels, low tunnels, hail netting, insect exclusion systems etc. to help reduce the variability of unpredictable weather, open up markets and provide employment consistency for good help. Amy Ivy has helped growers understand crop nutritional requirements, pruning and cultivar selection in these systems and Laura McDermott has worked with tunnels and exclusion netting systems to improve berry quality.
New & Emerging Pests	Spotted Lanternfly, Allium Leafminer, Spotted Wing Drosophila, Brown Marmorated Stinkbug, Swede Midge, Leek Moth, Black Stem Borer…..each year the list of new and emerging pests grows. ENYCHP specialists remain on the front lines, monitoring for pests and providing information on ID and management.
Integrating Information Technology	Jim Meyers has been leading the charge in utilizing data and integrating it into usable formats for grape growers in the region. His first project has focused on weather data, but the possibility of using drones to gather information to help growers diagnose specific problems and take immediate action is part of the plan.
Food Safety	The Food Safety Modernization Act (FSMA) has put Food Safety concerns in the spotlight. This year the team hosted two meetings addressing Listeria in apple pack houses and several Farmer Food Safety Trainings.

Attention Vegetable Growers:

Please join us for either or both of these free webinars. We'll share our research results with you and welcome your questions related to the topics of each session. We will be using Zoom for the webinars. You don't need a Zoom account, but you will need a computer or smart phone with high speed internet access.

There is no cost but you need to register online through the links below in order to receive the webinar access information.

If you can't make the live webinars we will be recording and posting them online where you can access them later. For more information contact Amy Ivy at adi2@cornell.edu or 518-570-5991

Sponsored in part by the Northern New York Agricultural Development Program. Funding for the Northern New York Agricultural Development Program is supported by the New York State Senate and administered by the New York State Department of Agriculture and Markets. Learn more at www.nnyagdev.org

Date and Time: Thursday, Nov 8, 2018 7-8:00pm

Topics: **Fitting Cover Crops in Vegetable Production Systems**

Speakers: Mike Davis, Willsboro Farm Manager, Chuck Bornt and Amy Ivy, Regional Vegetable Specialists

Link to register (no cost): https://enych.cce.cornell.edu/event.php?id=1008

Date and Time: Thursday, Nov 29, 2018 7-8:00pm

Topics: **Recent Research Results with High Tunnel Vegetable Crops** (winter spinach fertility, earliest warm season crops, red bell pepper varieties, pruning and training peppers and cherry tomatoes)

Speakers: Mike Davis, Willsboro Farm Manager, Judson Reid and Amy Ivy, Regional Vegetable Specialists

Link to register (no cost):

https://enych.cce.cornell.edu/event.php?id=1013

ANNIE'S PROJECT

EMPOWERING WOMEN IN AGRICULTURE

Sponsored by

Cornell Cooperative Extension
Eastern NY Commercial Horticulture Program

Cornell Cooperative Extension
Ulster County

All sessions

9:30 am - 2:00 pm

CCE Ulster County

232 Plaza Dr.

Kingston, NY 12401

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

November 12—Introduction—Identify your strengths as a farm business manager. Topics: risk management and building a resource network.

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

USDA Risk Management Agency

ALBANY, NY

2019 EASTERN NEW YORK FRUIT & VEGETABLE CONFERENCE

Cornell Cooperative Extension
Eastern NY Commercial Horticulture Program

FEBRUARY 19TH-21ST, 2019

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!

Tuesday February 19th– Thursday 21st, 2019

Desmond Conference Center
660 Albany Shaker Rd
Albany, NY 12211

Sessions will include:

Tree Fruit
Vegetables
Berries
Grapes
Business Management
Industry Trade Show
General Session: Pollination ***new***
FSMA Grower Training Course ***new***
Irrigation ***new***
Vegetable Fertigation ***new***
CSA Farming ***new***

Save the Date!

2019 New York Labor Road Show II Coming in January

Jan. 30, 2019 in Ballston Spa, NY
Jan. 31, 2019 in Plattsburgh, NY

Topics:

- Better Farmworker Housing Management and Compliance
- Onboarding New Employees
- Sexual Harassment Prevention Policies and Training
- Federal and State Wage and Hour Laws, Reminders and Updates
- 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

Fruit Category Pesticide Exam and Orchard IPM Basics

Date and Location:
1:30 to 3pm, November 27, 2018 – Clinton CCE Office, Plattsburgh, NY

Instructors:
Mike Basedow, ENYCHP Tree Fruit Specialist
Andy Galimberti, ENYCHP Technician

Sponsors:
Northern New York Agricultural Development Program and Eastern NY Commercial Horticulture Program

Agenda:
At this meeting, we will review orchard Integrated Pest Management (IPM), referencing from the NY Private Fruit Category (22) manual. We will first review the core foundations of integrated pest management, and then discuss as a group some of the key pests found in Northern New York orchards.

This meeting will provide training for the private category portion of the NY Pesticide Certification exam, and will also leave attendees better prepared to develop an IPM plan for their farm. Each farm attending will receive a copy of the Private Fruit Category Manual to take home.

This meeting will be held in conjunction with another program running from 10-1, which will discuss general preparation for taking the NY Pesticide Certification Exam. Participants can register for either meeting separately, or for both. Refreshments will be provided from 1:00 to 1:30, with the IPM lecture beginning at 1:30.

Registration:
You can register online at the following link. **https://pub.cce.cornell.edu/event_registration/main/events_landing.cfm?event=NovPesticide_209** or call or email Mike at 518 410 6823 or mrb254@cornell.edu.

How To Obtain a Pesticide Applicator License

CCE Clinton Office, 6064 Route 22 Suite 5, Plattsburgh

When: Tuesday, November 27th, 10am-1pm

What: Receive an overview of the application, testing process, and key concepts of the materials needed to obtain a private or commercial NYSDEC pesticide applicator license.
Cornell Extension and NYSDEC specialists will be on hand to present information and field questions from participants. Applications for future exam dates will be accepted by DEC staff at the conclusion of the meeting. An optional review of the tree fruit private Category 22 will be offered in the afternoon from 1:30 to 3. Participants can register for either event alone, or for both. The afternoon portion of the meeting is being sponsored by the Northern New York Agricultural Development Program.

Registration link:
https://reg.cce.cornell.edu/NovPesticide_209
Questions? Call CCE Clinton County at 518-561-7450
