Massachusetts Fruit IPM Report for 2022

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Weather

Minimum winter temperature was -4 degrees F. on 16 January 2022. No winter injury to fruit buds observed or reported, largely because temperatures were steady and cold beginning in December and continuing through February (meteorological winter). For the second year in a row, snowfall was modest at best.

Spring came about right on time as far as the fruit trees were concerned, McIntosh green tip occurring April 8. Average spring temperatures brought about bloom right on schedule, McIntosh full bloom on May 10. At the UMass Cold Spring Orchard in Belchertown, MA, there were no frost/freeze problems during the spring, although some orchards flirted with damaging temperatures. Apple bloom was generally modest across the board after a heavy crop in 2021. Some Honeycrisp blocks in particular were weak in bloom quantity, and ended up producing few to a modest amount of apples (for the second year in a row in some blocks). Peach bloom was interesting, we noted very light bloom in some varieties, others were much better, no explanation for that except maybe, like the apples, some varieties needed a "rest." Plus, it was wet and not too sunny in 2021 which may have impacted flower bud development. Despite some early panic as to the lack of bloom, the peach and apple crop turned out to be decent, nothing to write home about, but certainly adequate (with the exception of a few orchards/blocks/varieties). Shall I say production of apples was probably a bit down off of the average?

Summer, unlike in 2021, was dry, dry, dry. Much of Massachusetts was under moderate to severe drought beginning in late June. Much of eastern Massachusetts was in a severe drought. At the UMass Orchard, we saw some thunderstorm activity that ameliorated our drought. Irrigation (and a good water supply) has become a must if you care to farm in this day and age of climate change. Orchards that did not have irrigation suffered in terms of final apple and peach size. It was kind of hot overall, but not excessively so. Low 90's were common, and in early July some apples exhibited sunburn symptoms, and we flirted with more sunburn risk in August which largely did not materialize, thanks to higher humidity and lower than forecast high temperatures. Taking steps to protect apples from sunburn may become a necessity going forward. A summer high temperature of 93 degrees F. was recorded on 23 July, 2022. A stretch of particularly onerous dew points and temperatures in the low 90's during the first week in August made outdoor life (for people and pets) miserable. It did seem like there were a lot of sunny days, and dry weather made brown rot in peaches largely a non-issue. The copious sun also resulted in peaches and apples having very good flavor and overall quality that was noted by most.

Post Labor Day the **Fall** weather turned very seasonal (if not coolish) interspersed with some much needed rainfall. This was a welcome change from many past Septembers that were a bit hot. ReTain applications seemed to work very well in preventing pre-harvest drop, except in drought-stressed orchards where considerable drop (of McIntosh) was noted. Somewhat remarkably, there were very few complaints from growers about the crop quality, weekend weather for PYO, customer count, and crop sales. Growers for the most part raised their PYO prices in 2022. However because all orchard inputs (fertilizer, pesticides, diesel, etc.) were significantly higher in 2022 and still increasing, it remains to be seen if individual orchards will be profitable this season.

NEWA update: During 2022 there are 35 active NEWA (https://newa.cornell.edu/) on-farm weather stations in Massachusetts. NEWA 3.0 has been operational for the full year. If you have not set up a NEWA account, you are missing out on ease of use to quickly get to the weather information you need to make crop management decisions. Visit the NEWA Help Desk (https://newa.cornell.edu/help) for more information and Help (D'oh!). If you don't have a weather station and would like to be on NEWA – where you can take advantage of many Crop, IPM, and Weather tools – feel free to contact Jon Clements, UMASS @ jmcextman@gmail.com or in NJ Dr. Peter Oudemans @ oudemans@rutgers.edu.

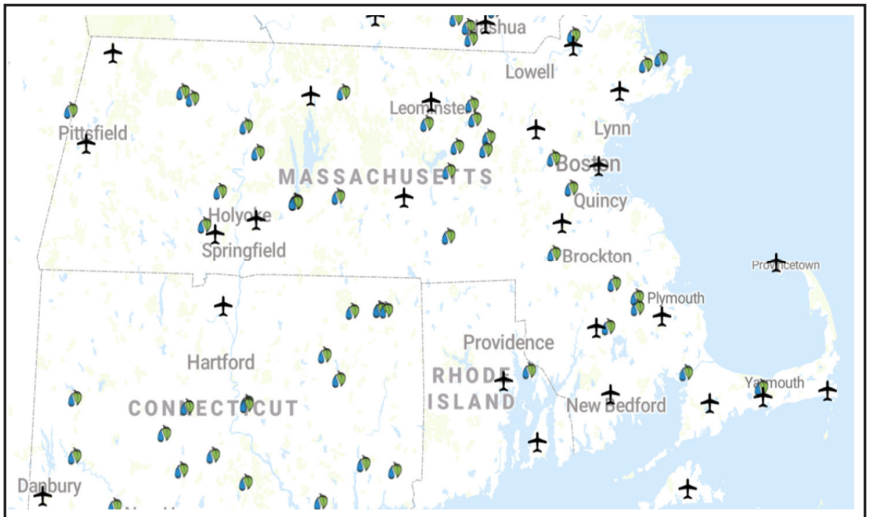


Figure 1. NEWA weather stations in Massachusetts, October 2022. The blue droplet and green leaf symbols represent the locations of the weather stations.

Diseases

One good thing about the "drought" in MA this summer is it was bad for diseases. They were generally easy to control in 2022 with a few notable exceptions.

Apple scab pressure during the primary season was modest, and most if not all growers achieved 100% acceptable scab control. The number of primary apple scab infections at the UMass Orchard varied, depending on which decision support you used, but are close: NEWA - 7 primary infection events; RIMpro - 6-8 primary infection events depending on your risk tolerance level. As we've seen in previous comparisons, NEWA ended primary season much earlier than RIMpro, with 99% ascospore maturity on 24 May for NEWA, and on 6 Jun for RIMpro. This year, that did not translate into a significant difference in infection periods.

With **fire blight**, some nail biting went on in MA, and 2-3 streptomycin applications were typical. At the UMass Orchard, according to RIMpro, the fire blight infection threshold was actually reached 6 times! There was a rather extended bloom period across many apple and pear varieties. There were no fire blight strikes observed afterwards, thanks to those strep applications. However, some orchards reported fire blight strikes later in the summer, typically where no streptomycin was applied. Fire blight is here to stay, or as the epidemiologists say, endemic.

Powdery mildew, given the rather dry spring and summer, was bad at the UMass Orchard in some varieties, particularly Honeycrisp. Bad means the Orchard staff spent time cutting it out, which is a dubious management practice at best. More attention needs to be applied in early spring to select fungicides which are effective against powdery mildew rather than focusing on scab alone. Interestingly, not much fruit showed signs of mildew infections, just vegetative shoots.

Rots, black and bitter were minimal, particularly when compared to the wet 2021 year, however, at least one MA orchard reported a continuing problem. Another orchard that had a big problem last year went on a more specific and rigorous fungicide program and reported no rot this year. The dry summer probably helped there too. Growers need to be more aware of effective fungicide programs, particularly the timing around bloom and fruit set, to prevent rot in wet years.

Marssonina leaf blotch appeared again at the UMass Orchard in September in the usual spots (Figure 2). Evercrisp is particularly problematic, and in wet years, growers need to continue fungicide sprays into September otherwise your Evercrisp will defoliate prematurely. Otherwise, no fruit symptoms were observed. Fuji and Honeycrisp are also susceptible. Some of the MAIA test selections seem susceptible (Sweet MAIA

Figure 2. Marssonina leaf blotch at the UMass Cold Spring Orchard, 19 September 2022.

among a couple others), they likely have Fuji, Evercrisp, and/or Honeycrisp as parents. A strong season-long fungicide program, particularly during wet seasons, should keep Marssonina at bay. Note that Cevya fungicide now has a 2EE-17 supplemental label specifically for use on fruit to control Marssonina leaf blotch. PHI = 0 days.

One last thing, we confirmed (via the UMass diagnostic lab) the presence of **southern blight** in a younger orchard which was causing trees to collapse and die (Figure 3). It had escaped us that we previously also had a confirmed diagnosis for southern blight in this block in 2017 when it was just planted (2nd leaf). Symptoms are similar to what you might see with Phytophthora crown rot. Southern blight should be on our radar screen. It probably is coming in on nursery trees. Once arrived, there are no very effective chemical controls. Good soil drainage and attention to irrigation practices (no overwatering) help. We will see if this problem worsens given the trend to warmer and wetter growing seasons. As with the apple rots, with climate change we are seeing more "southern" diseases.

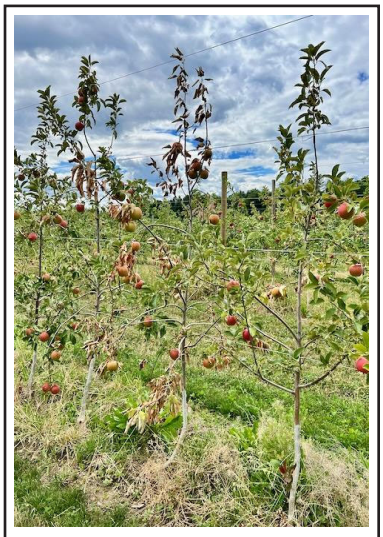


Figure 3. Crimson Crisp trees collapsing upon being infected by **southern blight**.

Insects

*In collaboration with **Jeremy Delisle and Heather Bryant** (University of New Hampshire Extension). Research supported by **Ajay Giri**, **Mateo Rull-Garza**, and **Heriberto Godoy-Hernandez**.*

PEST ALERT: The Spotted Lanternfly has become established in Massachusetts. The first established (breeding) population of spotted lanternfly (SLF) in Massachusetts was detected in the city of Fitchburg (Worcester County) in 2021. Additional SLF populations have been detected in Worcester County (Shrewsbury, MA in January, 2022; Worcester, MA in September 2022). As of August of 2022, a breeding population of SLF has also been detected in Hampden County, MA in the city of Springfield (Figure 4).

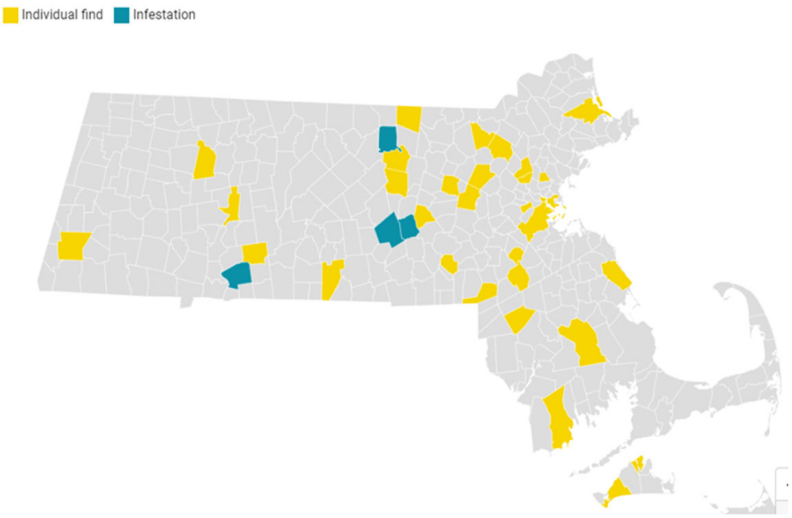


Figure 4. Distribution of spotted lanternfly in Massachusetts. Source: Matt Fortin Massachusetts Department of Agricultural Resources

According to Jennifer Forman Orth (MDAR): "*In Massachusetts, 33 communities have had spotted lanternfly sightings since 2018, and of the state's four local infestations -- in Fitchburg, Springfield, Shrewsbury and Worcester -- three came this year*".

Fruit injury assessments at harvest in MA and NH. In 2022, the UMass fruit team conducted pre-harvest surveys in 11 orchards (9 in MA, 2 in NH) to assess the level of fruit damage by arthropod pests. Two blocks were sampled per orchard; therefore, 22 blocks were surveyed. In all, 5,533 fruits were visually inspected (= non-destructive sampling) to assess injury.

Figure 5 shows the average level of injury by nine insect pests separately for each of the two blocks that were sampled. We are presenting results for each of the two blocks that were assessed to show that insect pest injury can vary from block to block.

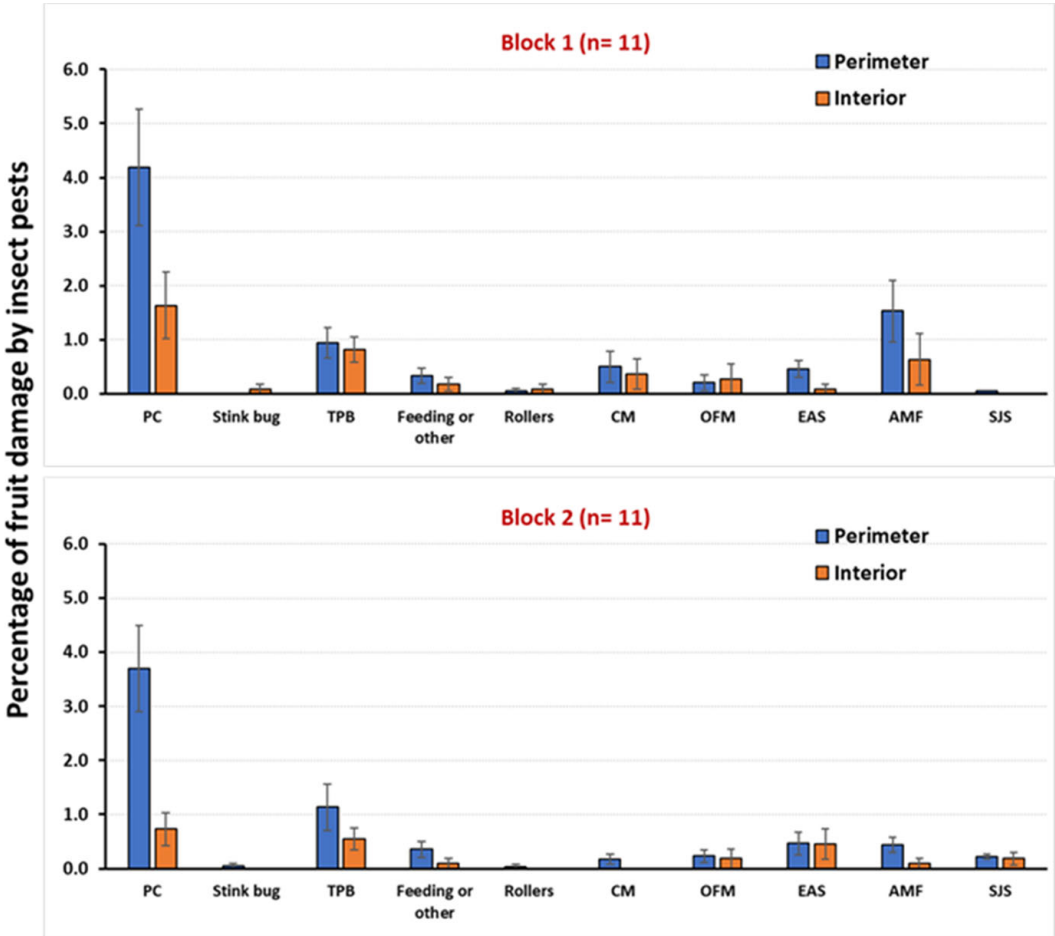


Figure 5. For each of two apple blocks per orchard, level of fruit injury by nine insect species recorded at pre-harvest surveys in nine MA orchards and two NH orchards.

Plum curculio (PC) continued to exert the greatest pressure in most blocks. In terms of injury to fruit sampled from perimeter-row trees, only 3 out of 22 blocks had zero PC injury (range: 0 – 12.5%). As expected, fruit sampled from interior trees had comparatively less PC damage; 12 out of 22 interior-fruit blocks received some level of PC damage (range: 0 – 6%). Apple maggot fly (AMF) mostly infested perimeter-row fruit in 12 out 22 blocks (range: 0 – 5.6%) while small levels of AMF oviposition injury were recorded in interior trees. In turn, tarnished plant bug (TPB) caused some injury mostly in perimeter-row trees in 9 out of 22 blocks (range: 0 - 2.7%). The level of fruit damaged by the other pests was kept at <1%.

Spotted-wing drosophila (SWD). Monitoring of SWD using diluted Concord grape juice continued in 2022. Figure 6 presents the seasonal activity of SWD in 6 MA orchards (traps were removed from the field in early August).

Parasitoids of SWD. JP collected raspberry fruit from a fruit farm located in western MA and with the help of Mateo Rull-Garza determined that multiple species of larval parasitoids were found attacking SWD. The level of parasitism was estimated to be around 24%. In British Columbia, researchers reported the presence of *Leptopilina japonica*, and *Ganaspis brasiliensis*. The range of parasitism in those samples was 0-66%.

Brown Marmorated Stink bug (BMSB). In 2021 and 2022, we sought to evaluate the extent to which sunflower and buckwheat could increase BMSB

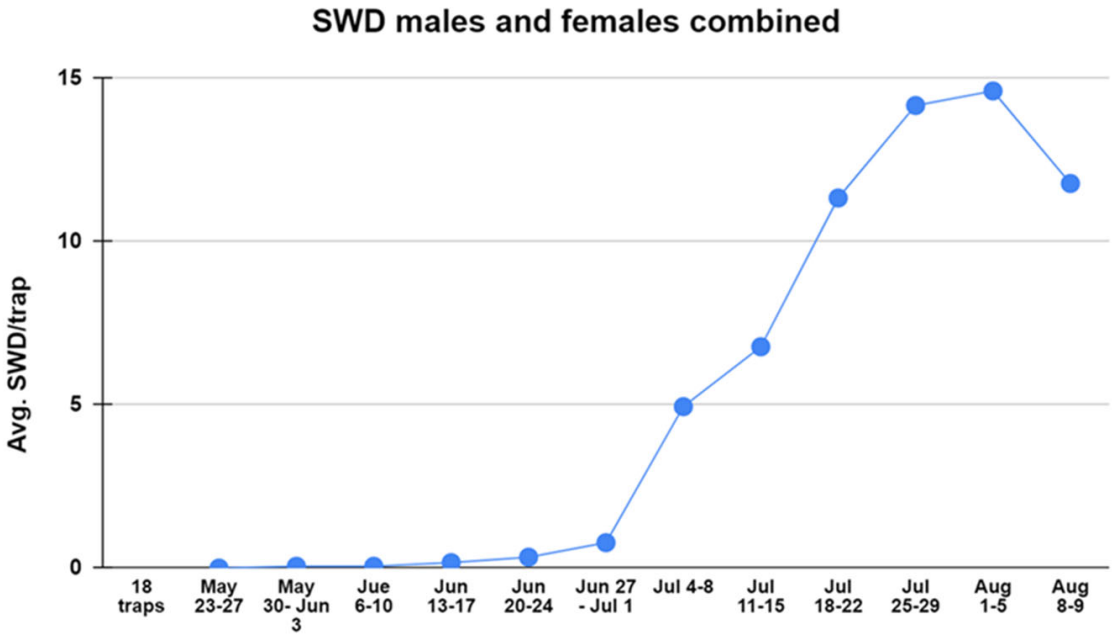
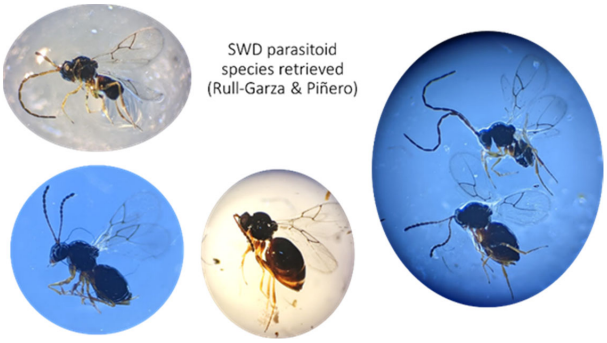


Figure 6. Captures of SWD in traps baited with diluted Concord grape juice deployed at six MA orchards in 2022. Trapping was discontinued in early August.



mortality in ghost traps (Figure 7), relative to that recorded in ghost traps alone. In 2022, research was conducted at 9 MA orchards and 1 NH orchard. This research is being conducted in collaboration with Jeremy Delisle (UNH Extension). Across the 10 participant orchards and across the entire period of experimentation (early July to late September), 655 BMSB (adults and nymphs combined) were killed by ghost traps in 2022. Three additional species of stink bugs were recorded this year: green (16 killed by ghost traps), brown (6), and green burgundy stink bug (4). For detailed results on the performance of trap cropping see accompanying Fruit Notes article.

In relative terms, BMSB populations in 2022

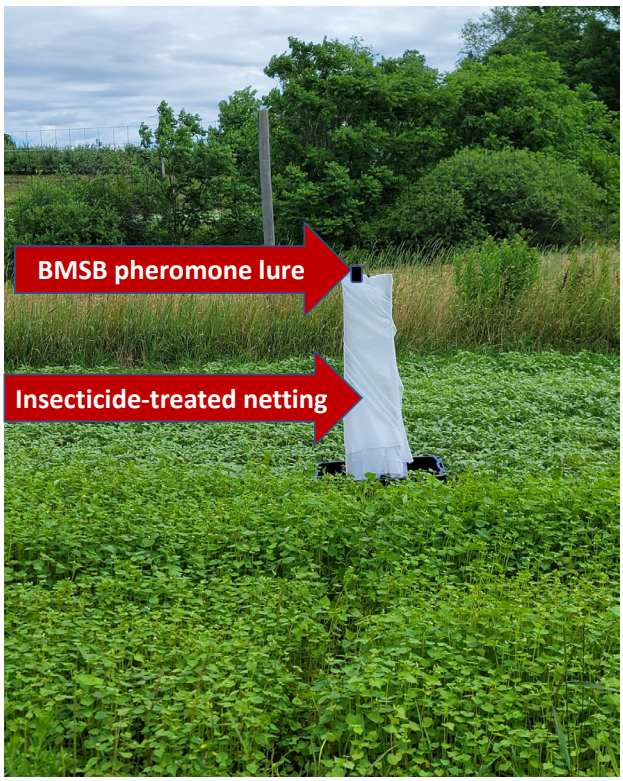


Figure 7. Current design of ghost trap evaluated by UMass researchers in association with trap cropping (dwarf sunflower and buckwheat).

were greater than those recorded in 2021, but lower than BMSB numbers recorded in 2020 (year of highest BMSB population levels recorded in MA).

Horticulture

A Review of the 2022 Chemical Thinning Season. The chemical thinning season once again proved to present new challenges. Return bloom in general was not robust. Some of this may be attributed to a heavy crop in 2021. Some varieties appeared to be more affected, especially Honeycrisp. The weather between harvest in 2021 and the bloom period in 2022 could be characterized as being somewhat normal so weather that occurred during the dormant period is unlikely to have influenced thinner responses in 2022. The early bloom period was cool, thus leading to slow flower development. The flowers on some varieties opened early leading to an extended bloom period. Early bloom and petal fall thinner applications during the cool weather were marginally effective. More favorable thinning weather appeared starting at the end of the third week in May. Favorable thinning weather appeared on about May 19 (late bloom) and extended for a period of about two weeks when fruit size reached 16 to 18 mm. The challenge for growers was to try to match specific thinners and their concentration with fruit size and the changing weather conditions. An important tool to accomplish this was the NEWA Apple Carbohydrate Thinning model.

Thinning experiments were conducted using the newly registered late-season thinner Accede™ and the much-anticipated thinner metamitron. **Accede** received full registration for use to thin apples in 2021, although full-scale, commercial use was delayed for a year. Paperwork for Metamitron registration was submitted by Adama to the EPA in December 2021 and approval is anticipated soon. Metamitron can be applied from the time the fruits reach 5mm to about 14 mm. It has proven to be a somewhat reliable thinner to apply when there is a significant carbon deficit. This year, Metamitron was successful at thinning Gala when applied at the 6 mm (petal fall) fruit size stage. Accede was evaluated as a thinner on Macoun apples when applied when fruit size was 16.9 mm. Accede did not thin in this experiment although the weather was not ideal for thinning when this application was made.

Accede (Valent Biosciences) had full registration for use on both apples and peaches, however, there was very limited formulated product available. Several growers applied Accede to peaches, with anecdotal results being positive. At the UMass Orchard, two applications of Accede were made to a mixed variety block of PF 'Flaming Fury' peaches, and the outcome – with very little hand thinning – was a nice crop of large peaches.

Bitter pit continues to be problematic in Honeycrisp blocks (Figure 8) despite copious calcium applications and leaf analysis results that looked good. Geneva rootstocks, particularly 41 and 11, have more bitter pit than, for example, Bud. 9. Be forewarned. Lightish crops of Honeycrisp with large apples spell a bitter pit problem. Horticulturally, this negative trait of Honeycrisp is most vexing.

Figure 8. Bitter pit on Honeycrisp followed by lenticel breakdown/rots. Picture credit: Jon Clements.

Precision Apple Crop-load MANagement (PACMAN) is a hot topic among industry, researchers, growers, and Extension these days. Industry in particular – for example Farm Vision Technologies (FVT) and FruitScout – is attempting to bring PACMAN to smaller growers. Both do precision apple thinning

using the fruitlet growth rate model, fruit sizing, and harvest yield estimation using hand-held "apparatus" centered around a smartphone, GPS, and digital camera. In 2022 at a grower orchard and the UMass Orchard, the Farm Vision Technologies "platform" was used in Honeycrisp, Evercrisp, Gala, and Fuji blocks and compared to manual measurements entered into the fruitlet growth rate model to predict thinning response based on fruitlets persisting vs. abscising. Although not without glitches, FVT looks promising and with further refinement could be very useful to apple growers trying to better manage apple crop load in smaller orchards of high value varieties such as Honeycrisp, Gala, Evercrisp, and Fuji. FruitScout claims to do the same thing using just a smartphone, however, we were not as successful in using their app and protocol, which we expect will be refined and revisited in 2023. For more information on Precision Apple Crop-load MANagement see https://pacman.extension.org/.

"A modern, pedestrian apple orchard system(s) comparison using a disease-resistant rootstock/variety combination to be planted in 2022" was funded by the **New England Tree Fruit Research Committee** (Thank you!). Rootstock: G.11 (fire blight resistant). Variety: Crimson Crisp (scab-resistant). Planting location: UMass Cold Spring Orchard, Belchertown, MA. In-row tree spacing (3 treatments, leader spacing similar across three systems at 1.5 feet: super-spindle, single leader,1.5 feet between trees; bi-leader, two leaders 3 feet, between trees; and UFO, 4-leader, 5 feet between trees (Figure 8); Between-row tree spacing: 10 feet. Replications: 5, with 6 trees per replicate, times 3 treatments (as above) = 90 trees total. The planting was successfully established and grew well in 2022 with the exception of some unplanned herbicide injury when Chateau was applied, that set some of the trees back (phytotoxicity), particularly the bi-leader and UFO multi-leader where foliage is closer to the ground and subject to drift.

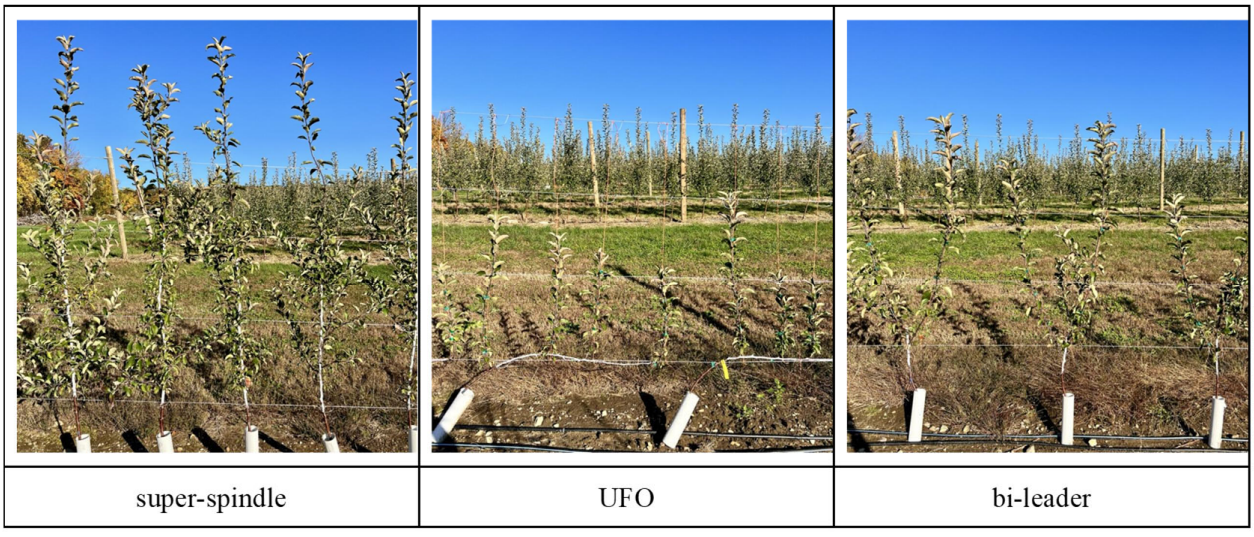


Figure 9. A modern, pedestrian apple orchard system(s) comparison using a disease-resistant rootstock/variety combination planted in 2022. Three training systems, Crimson Crisp apple on Geneva 11 rootstock.