Massachusetts Tree Fruit IPM Report for 2023

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Weather

Note: all observations from the UMass Orchard in Belchertown, MA. Minimum **winter** temperature was -13 degrees F. on February 4. This was preceded by the warmest January on record in Massachusetts with the average temperature being 35 degrees F in Belchertown. Within the week following February 4, it was obvious most of the stone fruit flower buds were damaged and there would be no peach crop in Massachusetts this year. Although growers were advised to prune peach trees aggressively to manage tree size given the lack of potential crop; interestingly, growers observed very little shoot damage to peaches from the deep freeze during the growing season. Cain and Anderson (1976), at Michigan State University, determined that minus 15 F was needed to injure peach shoots/wood.

Spring was about on time, McIntosh green tip occurring May 5-6. McIntosh bloom was a little early, May 2-3, but the bloom period seemed extended once again, petal fall was a good week later and later blooming varieties (Crimson Crisp) were still in bloom a week after that. Apple bloom was generally quite robust overall. On May 18, when many apple fruitlets were set and sized from 5 to 6 millimeters or larger, a freeze occurred with temperatures in the mid to upper 20s. The remaining flowers were damaged as well as fruitlets. The extent of the damage was widespread with site-specific variability. At the UMass Orchard, apples up on the hill were largely unscathed, while freeze damage on the "flats" and lower was minimal to nearly 100% depending on specific location and variety. McIntosh types seemed to fare better than Honeycrisp (later blooming) which seemed particularly sensitive to freeze damage as evidenced by russeting and cracking. Across Western Massachusetts, damage to apples was significant but depended on location. Eastern Massachusetts generally fared much better with some orchards setting a very heavy, sound crop of apples.

Summer, unlike the drought conditions experienced in 2022, 2023 was exceptionally wet. In Belchertown, monthly rainfall measurements were 9.5, 5.2, and 4.4 inches of rain in June, July, and August respectively for a total of over 20 inches on the ground. During the meteorological summer (June-July-August) temperatures were below average, but dew points remained consistently high, and nights did not cool off much.

Fall weather, post Labor Day, was initially quite hot, with the highest temperature all season of 92 degrees F on September 7. There was over 10 inches of rain in September, maintaining a wet growing season, often coming on weekends. State-wide the apple crop was down an estimated 25% on account of the May freeze, but because of the wet weather, orchards that operate as primarily pick-your-own still had plenty of apples on the trees post Columbus-day weekend. After the initial week of heat in September, temperatures became cooler, and as apples were taking a long time to color up, the pre-harvest drop was not excessive. Note: ReTain has been a game changer in this business.

NEWA update: During 2023 there are 39 active NEWA (https://newa.cornell.edu/) on-farm weather stations in Massachusetts. 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, Massachusetts NEWA state coordinator.

Diseases

The only real noteworthy item here is the **fire blight** "outbreak" that caught most of us by surprise when, apparently, the May 18 freeze served as a "trauma" event. At the time there was also some lingering secondary blossoms, AKA "rat-tail" bloom. During primary bloom, fire blight risk, as predicted by RIMpro, did not exceed threshold level(s) where an antibiotic was warranted. However, fire blight risk was off our radar screen post-bloom, and after tracing back when we first saw fire blight symptoms to early June, sure enough, the infection "event" occurred approximately at the time of the May 18 freeze (Figure 1). Anecdotally, guru Paul Steiner (University of Maryland) observed that some of the worst fire blight outbreaks in the mid-Atlantic followed a freeze "trauma" event (David Rosenberger, personal communication). Fire blight was widespread, with many Massachusetts orchards having varied amounts of fire blight. At the UMass Orchard, fire blight was particularly onerous on varieties that experienced freeze damage to lingering bloom on one-year-old wood and/or to fruitlets. Interestingly, Honeycrisp had very little (if any) fire blight even though fruits were severely damaged.

In further news…

Late season strikes were observed with no corresponding blossoms. Shoot blight, brought on by infection arising from invasion of developing leaves, was just one more of a litany of unpleasant fire blight occurrences this year. In particular, this was noted in a block of Pink Luster on M9 that had been planted this spring. The planting received strep applications during bloom and blossoms were removed to the best of the growers' ability. Many of these strikes resulted in infection making its way all the way into young trunks.

Another incident, that created much distress in the orchard due to the slight *resemblance* to fire blight, occurred in the late June to early July time frame. One full row of Empire apples, approximately 150 trees, rather suddenly up and died, or, at the very least began the long drawn out process of dying. Tissue samples were sent to multiple labs, none of which were able to isolate *Erwinia amylovora*. Tree fruit pathologists from around the region were consulted. Dr. Dave Rosenberger suggested that, perhaps, lightning had struck the trellis, leading to fire blight-like symptoms. On closer inspection, this hypothesis appears to be the best fit for the damage the trees incurred which includes: splitting that goes through the vascular cambium down to the sapwood (Figure 2), dead to dying shoots and limbs with no evidence of either the typical "shepherds crook", darkened cankers or ooze, and symptoms isolated exclusively to the single row in question. Belchertown residents report several "severe" lightning storms in this time frame.

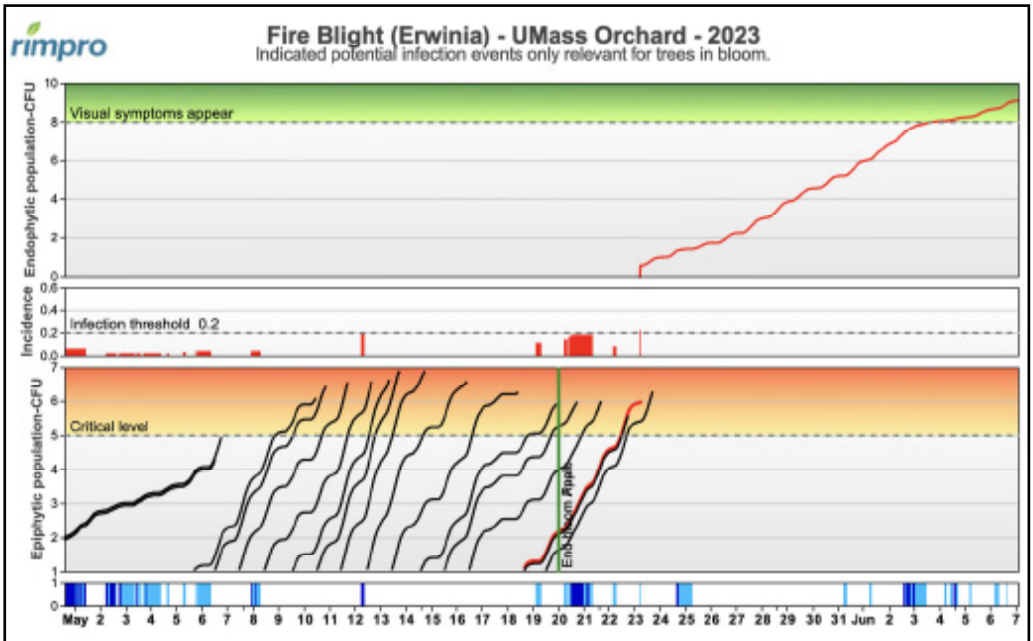

Figure 1. RIMpro output for UMass Orchard, spring 2023. Note the predicted infection event circa May 18-19 when the freeze occurred, and then the prediction of when visual symptoms appear June 3-4 when in fact visual symptoms were observed.

Insects

Japanese beetles. Observations indicated that Japanese beetle (JB) pressure was moderate this year, with some feeding damage observed on Honeycrisp in 3-4 orchards. Research involving mass trapping was conducted in grape and blueberry blocks at the UMass Cold Spring

Orchard (CSO) in Belchertown, MA. The results will be published in the Winter issue of Fruit Notes.

Figure 2. Trunk splitting, likely a result of lightning strike.

Borer activity. In various MA orchards, we received reports of injury to the base of trees. Upon observation, there were darkened cambial areas under the bark and uncommon instances of insect frass and lepidopteran pupal casings. We conducted assessments in 7 blocks in 3 commercial orchards and recorded the information presented in Table 1. Additionally, at the UMass CSO, where borer injury was reported in Honeycrisp grafted onto varied rootstocks, trapping was conducted, targeting both Peach Tree Borer (PTB) and Black Stem Borer (BSB), in an attempt to identify the active borer species. From August 10th to August 24th 12 male PTBs and 0 BSBs were captured. Insect damage doesn't seem to be the main culprit of tree bark cracking and damaged vascular tissue. Wood-boring insects may be responding to plant volatiles emitted by already damaged and/or stressed trees. Dr. Duane Greene suggested that winter injury is most likely the main cause.

Spotted-wing drosophila (SWD): In 2023, SWD populations reached their peak (Figure 3) about 2 weeks earlier than observed in previous years. For some fruit growers, SWD management wasn't as successful as expected. One grower reported SWD control failure in strawberry and blueberry due to excessive rain, which in addition to washing off the insecticide applications, also kept many customers away from the pick-your-own operation, resulting in a large portion of the crop not being harvested.

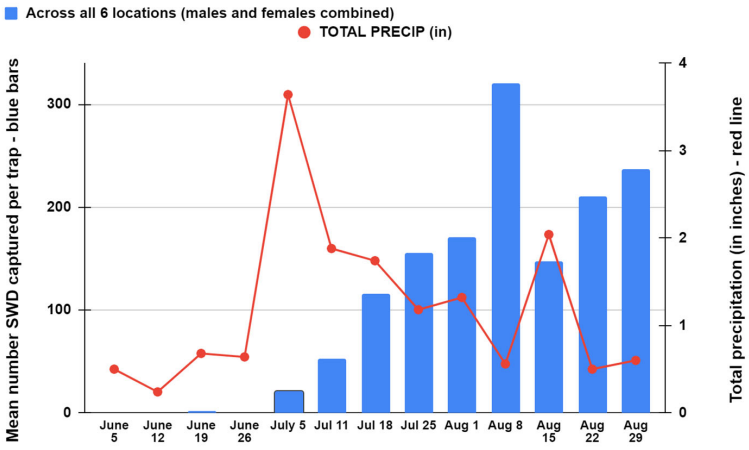

Figure 3. Spotted-wing drosophila seasonal abundance measured using traps baited with diluted Concord grape juice fermented in the presence of 2% table salt, a bait that is very attractive to SWD, and total rainfall (in inches) – red line, for each trapping period.

Levels of insect pest injury at harvest in 9 MA orchards: Overall, the levels of insect pest injury, in particular plum curculio and tarnished plant bug, were lower than those recorded in previous years. As shown in Table 2 Damage by tortricid moths was very low for codling moth (0 - 0.17%) and obliquebanded leafroller (0 - 0.17%) and non-existent for Oriental fruit moth. *Note that table 2 presents the results of PERIMETER-ROW injury only.* The interior-row injury was lower, as expected. Apple maggot fly (AMF) was well controlled in most orchards. A single orchard block (at CSO) subject to low sprays received 6.41% injury by AMF in the perimeter.

Table 1. Incidence of trunk injury observed in 7 blocks in MA, and number of trees with insect frass.

Block	No. trees inspected	No trees with darkened cambium	No. trees with frass
1 (G.11)	20	8	3
2 (Bud 9)	20	0	0
3 (Bud 9)	20	2	0
4 (Bud 9)	20	1	0
5	20	2	1
6	20	5	1
7	20	11	1
8	20	4	1

Spotted Lanternfly detected in three new Massachusetts communities (as of 9.21.23). The invasive

Table 2. For each of nine commercial apple orchards in MA, perimeter-row fruit injury by nine insect species. The fruit assessments were conducted at harvest in 2023.

Orchard #	Plum curculio	Stink bug	Tarnished plant bug	Other (feeding)	Rollers	Oriental FM	Codling moth	European apple sawfly	Apple maggot	San Jose scale
1	0.71	0.00	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	4.28	0.23	2.48	0.00	0.00	0.00	0.00	1.13	0.45	1.35
3	0.72	0.00	0.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	2.52	0.00	1.54	0.00	0.11	0.00	0.00	0.00	1.54	0.00
5	1.39	0.00	1.56	0.09	0.17	0.00	0.17	0.35	0.52	0.00
6	7.07	0.00	2.02	0.00	0.00	0.00	0.00	1.01	0.00	0.00
7	4.27	0.00	1.71	0.43	0.00	0.00	0.00	0.43	6.41	0.00
8	4.22	0.15	2.26	0.60	0.00	0.00	0.00	0.00	1.66	0.00
9	0.51	0.00	1.69	0.34	0.00	0.00	0.17	0.00	1.69	0.17
AVERAGE (%)	2.86	0.04	1.59	0.16	0.03	0.00	0.04	0.32	1.36	0.17

spotted lanternfly (SLF) has recently been confirmed in both Hampden and Worcester Counties in Holyoke, Agawam, and Southborough, MA (Figure 4). These finds represent three newly established populations of the insect, which are in addition to those known previously in Fitchburg, Shrewsbury, Worcester, and Springfield, MA.

A new Fact Sheet on SLF has been published by UMass Extension (lead: Ms. Tawny Simisky). The MA Department of Agricultural Resources also provides a "Spotted Lanternfly: Management Guide for Homeowners in Infested Areas".

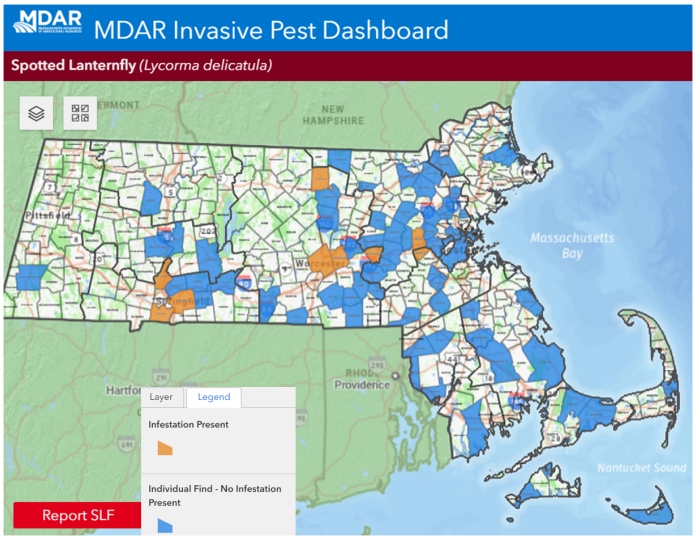

Figure 4. Current distribution of SLF in Massachusetts. Map: Massachusetts Department of Agricultural Resources - Invasive Pest Dashboard

Rosy apple aphid (RAA). RAA was introduced into North America from Europe in the late 1800s. In 2023, RAA populations were, generally speaking, lower in 2023 compared to the past two years. In 2021, RAA was most prevalent that the green apple aphid but the opposite was found in 2022. Observations conducted at three blocks at the UMass Cold Spring Orchard indicated that symptoms of RAA feeding activity were presented as early as petal fall, and by mid-June the winged adults had already dispersed to alternate herbaceous hosts, such as broadleaf and narrowleaf plantain. The levels of RAA parasitism by wasps recorded in 2023 were as high as 35% (on average) in Red Astrachan and Ginger Gold and as low as 5% (on average) in Dabinett (Figure 5). In 2024, we will increase our efforts to assess RAA presence and abundance in commercial orchards.

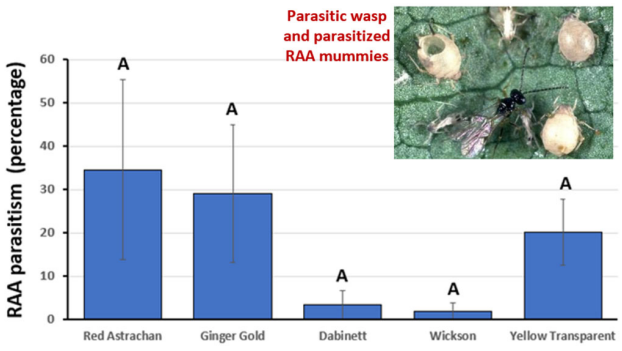

Figure 5. RAA parasitism averaged across all three apple blocks in early June 2023.

Brown marmorated stink bug (BMSB) and egg parasitoids. In 2023, BMSB populations were the lowest recorded in MA orchards since 2018. Almost no injury by stink bugs was recorded in commercial orchards in the harvest surveys. It is known that wet conditions can reduce BMSB populations by (1) increasing mortality of the small nymphs and (2) by providing adults with alternate food resources in the form of wild hosts feeding sites. In contrast, during dry summers, BMSB can feed more on fruits and vegetables due to the scarcity of other food resources outside farms. For instance, it is known that BMSB utilizes host trees within the forest edge habitats for early-season feeding and perhaps egg-laying. In 2023, we surveyed six fruit tree orchards located in the outskirts of either rural or suburban centers across Massachusetts based on BMSB habitat suitability data. In all, over 10,000 BMSB eggs were

deployed from early July to late August. All sentinel eggs were frozen at -80 °C for 48 hours prior to deployment. Once every two weeks, the team deployed a median of 392 eggs per farm. Egg masses were left in the field for 3 days, time period after which they were retrieved and inspected for signs of feeding by predatory, beneficial insects. The remaining eggs were incubated for 5 weeks to assess the emergence of parasitoids. The adult parasitoids that emerged most likely belong to the native species *Trissolcus euchisti* (species confirmation is pending). Total predation was estimated at 17.7%. We also learned the relative abundance of parasitoid species recovered was greater this year than that recorded in 2022. Collectively, this information will allow us to optimize our sampling efforts in 2024. So far, we have not been able to find the Samurai wasp (*Trissolcus japonicus*) in Massachusetts orchards.

Horticulture

Because of the freeze and lack of particularly good **chemical thinning** conditions – no carbohydrate deficit to speak of – when chemical thinners were applied, they were generally pretty ineffective. The result was a heavy fruit set post-chemical thinning window except where there was a lot of freeze damage (of course). The heavy fruit set made up somewhat for the overall reduction in the apple crop because of the freeze. In other words, it did not turn out as bad as originally thought. Some orchards had their heaviest apple crop in years. I noted that one orchard that was able to do more apple hand thinning because they had no peaches to hand thin had the nicest looking, well-balanced crop of apples I have ever seen in that particular orchard. After seeing some heavy crops of apples of marginal quality in the fall, I am convinced we don't spend enough time working on precision crop load management, whether it be precision pruning, predicting fruit set, precision chemical thinning, and followed by hand thinning where necessary. We spend a lot of time practicing integrated pest management (IPM), but not enough time practicing precision apple crop load management (PACMAN). Of course, our weather gets in the way, and for some varieties like McIntosh, it makes little difference, but for other varieties like Honeycrisp, over-cropping does us no favors at all.

One more thing, and it is important. By mid-summer, **some apple orchards started seeing patches of obvious apple tree decline as evidenced by off-color foliage and reduced tree vigor** (short shoot growth). Close inspection of the base of the tree revealed the bark was wholesale "sloughing" off the above-ground, exposed portion of the rootstock shank (Figure 6). Essentially this was girdling the trees. Signs of ambrosia beetle (black stem borer) infestation were also evident. Although some rootstock shank bark cracking has been observed previously, this year seems to be the "tipping point" where we are going to lose many trees. The prevailing theory is winter injury which is a result of "false springs" such as we observed in January 2023. (Terence Robinson has promulgated the "false spring" theory.) The bottom line is: **the rootstocks are coming out of dormancy prematurely in mid-winter, and then sudden temperature drops physically freeze free water in the cambium interface resulting in the separation and sloughing off of the bark**. We have seen this mostly on M.9 and several Geneva rootstocks. Otherwise, there is not much rhyme or reason to it. Orchards need to be aware of the potential problem and adopt management strategies to avoid all stressors to the trees; plant best sites, use B.9 or B.10 rootstocks (which seem to be somewhat more cold-hardy), plant the rootstock shank deeper, use berms/raised beds for water management, tile new orchard sites for water management, monitor soil moisture and irrigate as needed, paint trunks white to avoid southwest injury, avoid over-fertilization with nitrogen– to reduce the risk of this kind of tree loss occurring in the future. Climate change is one factor and definitely here to stay.

Figure 6. Rootstock shank "sloughing off" which effectively girdles or partially girdles the apple tree and results in tree decline, loss of productivity, and possibly tree death.

Special Projects/Research/Publications

Publications

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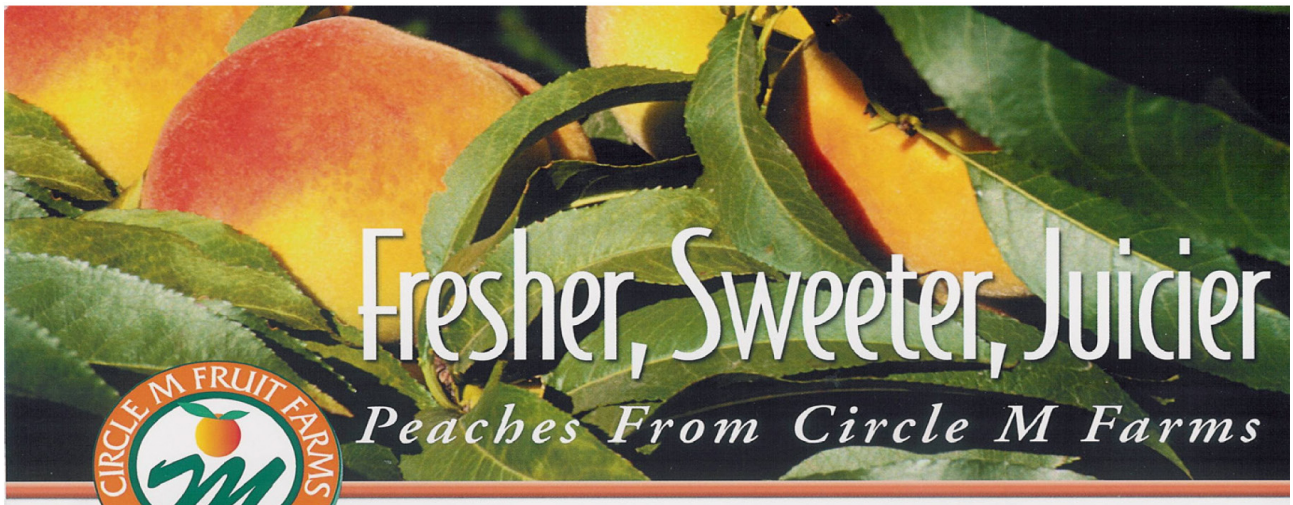

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