Healthy Fruit, Vol. 28, No. 12, June 9, 2020

Prepared by the University of Massachusetts Amherst Extension Fruit Team

Contents

Current degree day accumulations

UMass Cold Spring Orchard, Belchertown, MA (Since January 1)	8-June
Base 43 BE (NEWA, since January 1)	848
Base 50 BE (NEWA, since January 1)	475

Upcoming pest events

Adapted from Scaffolds Fruit Journal

Coming events	**Degree days (Base 43 BE)**

Black cherry fruit fly 1st catch	702-934
Black stem borer 1st flight peak	635-901
Codling moth 1st flight peak	562-980
European red mite summer egg hatch	737-923
Lesser peachtree borer flight peak	809-1734
Obliquebanded leafroller 1st catch	793-976
Obliquebanded leafroller 1st flight peak	851-1214
Oriental fruit moth 1st flight subsides	823-1094
Redbanded leafroller 1st flight subsides	610-891
Spotted tentiform LM 1st flight subsides	682-941
White apple leafhopper adults 1st present	679-1041

Upcoming meetings

UNH Extension: Third Tree Fruit Webinar for Commercial Orchardists. Wednesday, June 10, 2020. 5:30pm - 7:30pm. We will be holding our third of the season Tree Fruit Webinar for Commercial Orchardists on June 10th @ 5:30-7:30pm (2 pesticide applicator credits). Pre-registration required. Sign on early if you are new to zoom. This event will include Tree Fruit Insect Updates from Jaime Piñero (UMass) and Anna Wallingford (UNH), a summary of a recent peach variety trial from Tom Callahan (Adams County Nursery) & George Hamilton (UNH), and a summary of resources for responding to COVID-19 from Jeremy Delisle (UNH). Portions of

the meeting will be recorded and available on our YouTube channel by Friday after the meeting, but you must attend the live event to earn pesticide credit.

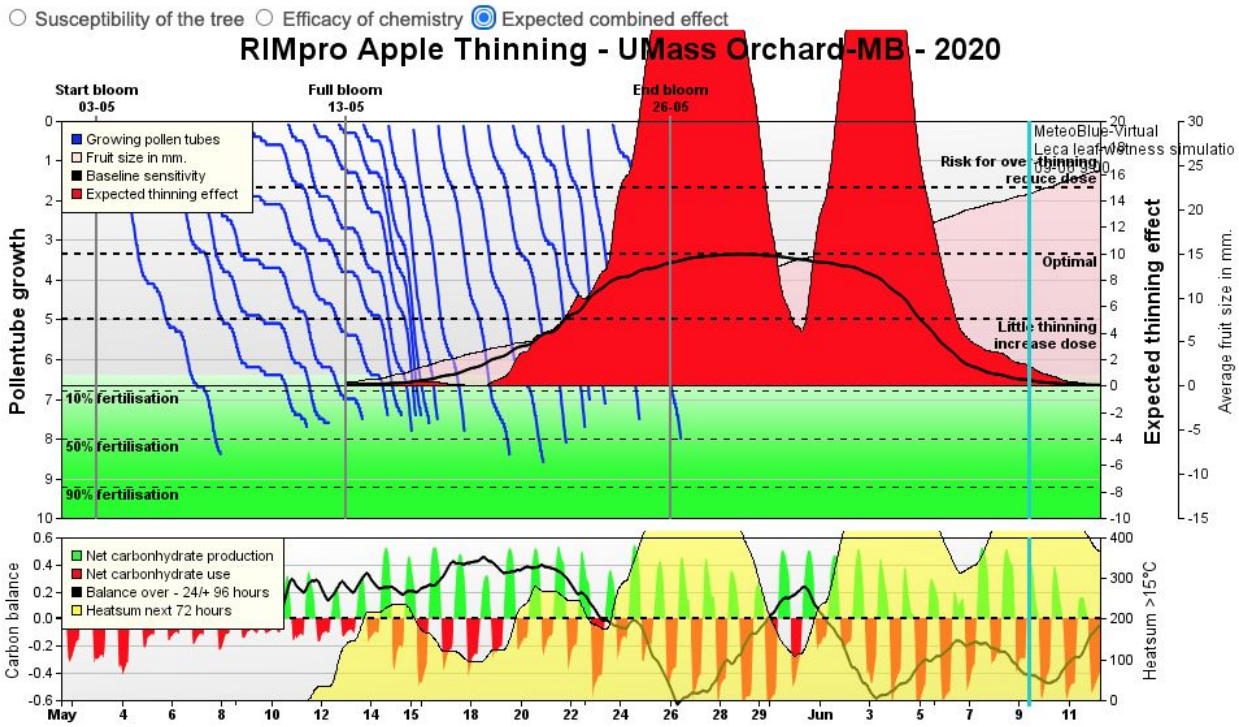
The way I see it…

Jon Clements

I am done measuring apple fruits as of last week to see what is setting based on the fruitlet growth rate model. I was kind of surprised -- or maybe not so much? -- to realize that things were really thinning down. Gala and Honeycrisp had reached the target crop load of 80 and 60 apples per tree respectively predicted setting. Pazazz had actually fallen below the target fruit load -- all the fruits in many clusters had simply stopped growing. (I know you don't really care about Pazazz.) I have to double check but I believe a petal fall and then an app. 10-12 mm chemical thinning application was applied to these trees. BUT, that heat we had back during the last week in May resulted in a significant carbohydrate deficit that was equivalent to a chemical thinning application. See below for a graphical representation. I expect we are going to see a pretty good "June drop."

That's about all I got. Calcium should be going in with cover sprays. See fact sheet F-119R Foliar Calcium Sprays for Apples. Things look OK out there right now, but I suspect that will change as it always does as various disorders, insects, and diseases come out of the woodwork. Anyone seen any fire blight strikes yet???

Significant carbohydrate deficit at the UMass Orchard equivalent to a chemical thinner application



Rimpro.eu apple fruit thinner for UMass Orchard in Belchertown is literally “off the charts.” This will result in a significant June drop.

Insects

Jaime Piñero

Weekly report of insect pest captures in monitoring traps at CSO (Belchertown, MA)

Period: 6.2 - 6.8

Insect	Average captures/trap	Notes
RBLR	1	Pheromone-baited trap
OFM	22	Pheromone-baited trap
CM	0	Pheromone-baited trap
Spotted tentiform leafminer	14	Pheromone-baited trap
Tarnished plant bug	0.04	Unbaited white sticky cards

European apple sawfly	0.0	Unbaited white sticky cards
Plum curculio	0.0	Odor-baited black pyramid traps

Plum curculio (PC) update.

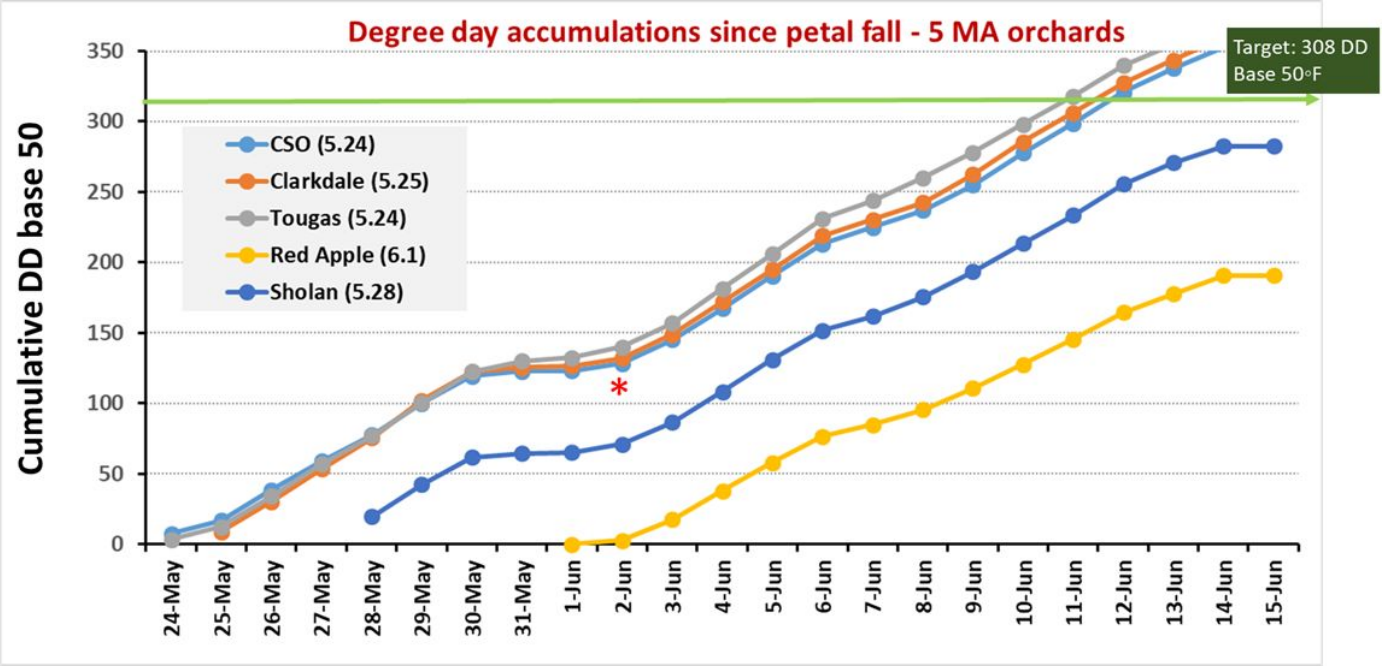
Oviposition activity by PC females has decreased for the last 2-3 days. Perhaps the most important question you have about PC at this moment is whether you need to apply a second cover against this insect pest.

To answer this question, we can use information from the heat-unit accumulation model developed by Reissig et al. (1998), which relates cumulative fruit injury to cumulative heat units (degree-days base 50°F [DD50]) following petal fall. Basically, it indicates that the last spray against PC should have sufficient residual activity for effective control until 308 DD50 have accumulated since petal fall.

Please note that one shortcoming of using this model involves uncertainty of the extent to which insecticide residue truly remains effective, because it assumes sufficient insecticide protection to fruit for about 14 days after insecticide sprays.

So, back to the question. **My recommendation for the UMass Cold Spring Orchard (CSO) is not to spray again against PC,** based on the following information.

The chart below shows degree-day accumulations (base 50◦C) for five MA orchards starting at petal fall. The petal fall spray dates are given in parentheses. Note the predicted DD accumulations for the next five days (using the Cornell NEWA Degree Day calculator):



At the UMass CSO, the petal fall insecticide spray took place on 5.24 and the first spray cover was applied on June 2nd (see red asterisk below the light blue line). Based on the predicted DD accumulation, in Belchertown we will reach the 308 DD50 threshold around **June 11-12 (= 9-10 days after the first cover)**. Based on this DD accumulation model, and assuming there is sufficient insecticide protection to fruit, then **there won't be a need to spray against PC again at the UMass CSO**. Note that two other orchards are expected to reach the DD threshold at around the same time.

Apple Maggot Fly (AMF) update.

Invitation to participate in our 2020 AMF research. In 2019, we conducted one study that quantified the level of AMF control achieved in six commercial orchard blocks using a novel attract-and-kill strategy involving use of synthetic lures deployed in perimeter-row trees in combination with insecticide sprays with 3% sugar added to the tank mix. Sugar is a phagostimulant that readily induces feeding by adult fruit flies upon contact. We expected to bring AMF adults to perimeter-row trees where they could be killed by the insecticide sprays, before they could penetrate into interior trees. Subsequent flies arriving to the baited tree canopies were expected to continue sensing sugar on the foliage and fruit which would induce flies to ingest insecticide residue.

This year I would like to increase the number of orchards from 6 to 10-12. We would need access to two blocks, each 1-5 acres in size. If interested, please let me know

(jpinero@umass.edu) at your earliest convenience. We are currently preparing the sticky spheres and ordering supplies…

Below is a summary of what the research entails. The approach is quite simple and inexpensive.

For more details about methods and the results we found in 2019, I would like to refer you to the Guest Article section (at the bottom of this Healthy Fruit), which reproduces an article titled "Evaluation of a grower-friendly attract-and-kill strategy for apple maggot control in New England apple orchards", originally published in Fruit Notes (spring, 2020).

General approach in the attract-and-kill blocks:

(1) Deployment of synthetic apple blend lures on perimeter-row trees, every 30 yards. *The lures are expected to draw AMF to the block perimeter.*

(2) Application of insecticide mixed with 3% sugar as a phagostimulant, to perimeter-row trees only. *The sugar is expected to arrest flies on treated trees, increasing mortality because the sugar will induce flies to ingest insecticide residue before the next spray.*

General approach in the grower control blocks:

(1) Grower sprays using a standard approach.

AMF monitoring and infestation data (both types of blocks).

- Both blocks will receive eight unbaited sticky spheres deployed along the perimeter (2 spheres per side).

- Both blocks will receive four unbaited sticky spheres placed on interior trees, to monitor AMF penetration.

- All sticky spheres will be inspected by us once a week, and trap capture data will be sent out to participant growers. This information can help growers determine the timing of sprays.

- At harvest, the UMass team will carefully inspect fruit for AMF egg-laying punctures, and fruit suspected to be damaged will be brought to the laboratory, where it will be incubated individually for 4-5 weeks, in order to confirm presence of larvae/pupae.

Spotted Wing Drosophila (SWD) update.

In late April, traps baited with commercial lures and with diluted Concord grape juice were deployed at 4 locations in MA.

The first SWD captures took place on May 25th in Deerfield. One trap baited with diluted grape juice captured 2 SWD females. One trap baited with Trécé lure A caught 2 females and one trap baited with Trécé lure B captured 3 females. On June 1st, 1 SWD female was trapped in a diluted grape juice-baited trap (Amherst)

Diseases

Liz Garofalo and Dan Cooley

Watching the weather

With the exception of powdery mildew (PM is happy with just high relative humidity), the most troublesome diseases that crop up in the orchard rely on moisture, generally in the form of precipitation, to cause infection. With little to no rainfall, disease management *may* be a little easier, for now.

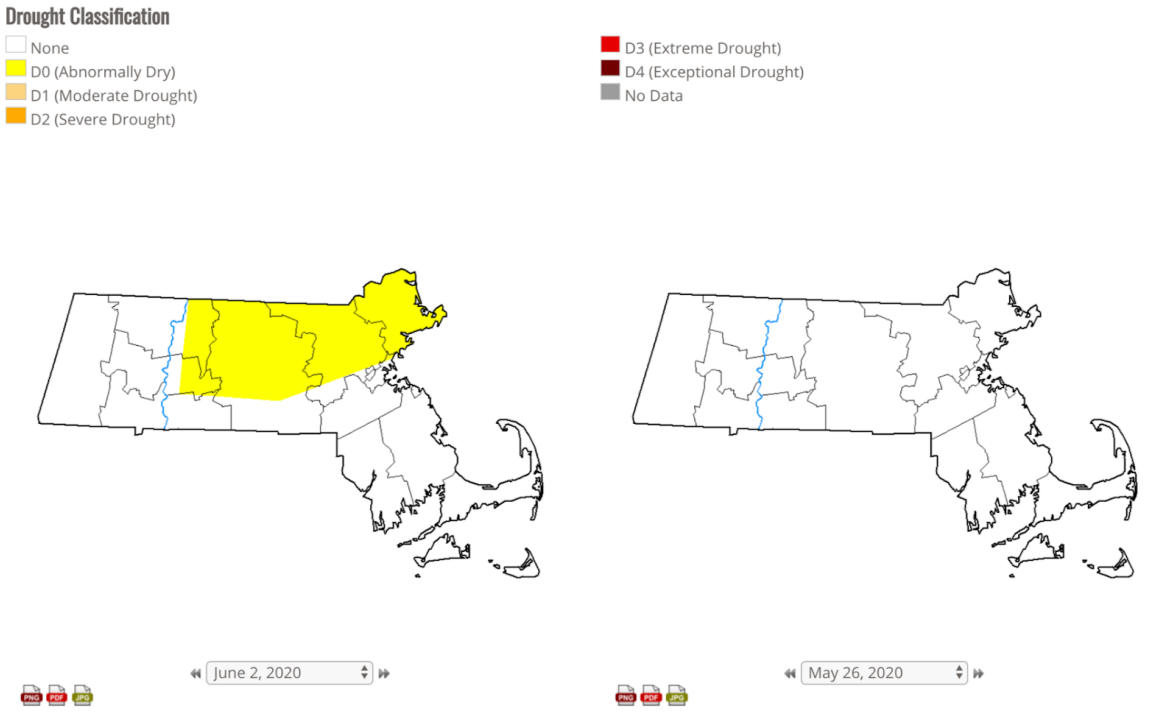
Apple scab

Ascospores continue to mature and are ready to eject with the next rain. NOAA currently forecasts thunderstorms and rain for Thursday and Thursday night. Let's hope this holds and delivers. For warmer locations that have received more rain, this next rainfall will put the final nail in primary scab season. Here in Greenfield in the northern Connecticut River Valley of MA, I am still seeing a fair number of spores, and there is a reasonable chance that if we do get rain this Thursday, there are still enough mature spores left to cause late season primary infections.

	Ascospore Observation Method and Spore Count		
Date	Petri Plate Assay	Funnel Trap	Total Count
3/31/20	0	0	0
4/7/2020	0	21	21
4/14/2020	1	0	1
4/20/20	162	117	279
4/28/20	95	44	139
5/5/20	89	1421	1510
5/12/20	259	5275	5534

5/18/20	205	Too many to count*	205*
5/26/20	162	1967	2129
6/1/20	1060	6294	7354
6/8/20	**259**	**4222**	**4481**

I covered the effect of dry periods on ascospore development in last week's Healthy Fruit so will not belabor the point this week. Suffice it to say, dry weather prolongs ascospore development and release.



Statistics Comparison

Week	None	D0-D4	D1-D4	D2-D4	D3-D4	D4	DSCI
2020-06-02	65.65	34.35	0.00	0.00	0.00	0.00	34
2020-05-26	100.00	0.00	0.00	0.00	0.00	0.00	0
Change	34.35	-34.35	0.00	0.00	0.00	0.00	-34

U.S Drought monitor; middle left, most recent information on rainfall deficit in MA compared to, middle right, map of last week's rainfall deficit information. Bottom, table showing the weeks being compared, percent of the state not experiencing water deficit, percent of the state experiencing abnormally dry conditions (34.35%). The remainder of the table describes more severe drought conditions which none of MA is currently experiencing.

In Belchertown, we are currently down 4.67 inches total precipitation accumulation for the year from the "normal" 19.68 inches (data sourced from SC ACIS). This does land Belchertown in the

“abnormally dry” category listed above in the National Drought Monitor. While upcoming rain may increase disease pressure, it will not likely go far to alleviating the dry conditions we are seeing.
The other issue that is likely to pop up as a result of this dry weather, and subsequent tree stress is increased infection by more opportunistic pathogens, ones we do not usually think of as benign pathogenic. Flashback to 2016, coming out of drought conditions, trees were stressed and there were many instances of **phomopsis** showing up in previously healthy trees. While phomopsis does require moisture for spore production and dispersal, trees that have been weakened by, drought for example, are more prone to infection. This makes irrigation, especially on young or dwarf trees even more important! Older, larger trees with sturdier root systems seem to be less affected by these opportunistic fungi under drought conditions, but are still not impervious.

Peach Leaf Curl
This has been one of those years for peach leaf curl. It’s a spectacular disease, visually, deforming leaves into gnarled, warty things, colored red, purple and yellow. Unfortunately when you see those leaves, it’s too late to do anything about it this year. Infection happened at some point when the peach buds first started to swell. At that point, rain can wash the fungal spores that cause leaf curl into the crevices of the swelling bud, where they germinate and grow.

The key to management is having a fungicide in place on the dormant buds prior to bud swell. A registered copper material is particularly good, as it will also help manage bacterial spot. However, other fungicides are registered for leaf curl. If you have a bad leaf curl outbreak this year, use both a fall and spring application for the upcoming season. A fall application of a registered leaf curl fungicide, after 90% leaf fall, will reduce the fungal inoculum on and near buds. The most critical application is in spring, before buds swell. The more dilute the application the better, to maximize coverage.

But, you say, I did that this past year, and I still have the disease! I’m not sure exactly why that is, but here are some ideas, largely related to weather. This past January and February there were a couple of days that were at or a little above 70. That’s enough to make some buds start to swell. By then, the fall fungicide is long gone, and nobody is running their sprayer. The fungus doesn’t care. It can take advantage of those loosened buds. The fungus grows best when temperatures are cool (50 to 70ºF) and wet. While March and April weren’t particularly wet, they were wet enough, and temperatures were low enough that peaches developed slowly. This allowed a lot of time for leaf curl infections.

Given the strange winters we are having, with warm days now and again, it may be necessary to get on the spring dormant leaf curl sprays earlier.

Peach leaf curl 2020. Photo Jon Clements

Horticulture

I too often fail to see attention paid to new apple plantings particularly in terms of tree training. By that I mean not stripping out competing shoots with leader growth, you really need to strip those out or pinch them so as to maintain the dominance of that one central leader. Don't wait too long, as soon as it's clear they are competing with the leader. For example, see Techniques for Training Young Apple Trees.

My longstanding colleague and "friend" Win Cowgill and I have a longstanding discussion (argument?) about the use of glufosinate-ammonium (Rely, Cheetah) on tree fruit. I am going to reprint a portion of his recent Win's Tips newsletter from May 4, 2020 here. You can judge for yourself, but I will remind you the Rely label specifically states "Avoid contact of Cheetah solution, spray, drift or mist with green bark, stems, or foliage, as injury may occur to trees, vines, and berries. Only trunks with callused, mature brown bark may be sprayed unless protected from spray contact by nonporous wraps, grow tubes, or waxed containers. Contact of Cheetah with parts of trees, vines, or berries other than mature brown bark can result in serious damage."

May 4, 2020. Volume 4, Win Tips #30.

Win Cowgill
Professor Emeritus, Rutgers, the State University
Visiting Scholar, UMASS-Amherst
CEO - Win Enterprises International, LLC

Editor Horticultural News
PO Box 143
Baptistown, NJ 08803
Office 908-489-1476
Fax 908-996-6404
Email: wincowgill@mac.com

Growers - the topic for this message is the use of Rely/Glufosinate herbicide. Brad Majek (Rutgers) and I did replicated research with this herbicide at both Cream Ridge for peach and on mature apple trees at Best Fruit Farms over 20 years ago. Unfortunately the new 2020 Rutgers Tree Fruit guide, references its use for all tree fruit crops. In my opinion it SHOULD NOT BE USED ON TREE FRUIT - the Rutgers Footnote warning #3 in Table 2.1- is “do not let spray touch any part of the tree, including mature bark.” All growers apply herbicides with a Phil Brown type boom, with an offset nozzle that overlaps the tree/rootstock, to ensure you do not leave any untreated areas. In addition we are not using air induction nozzles in our herbicide sprayers, so even with a shielded boom, we can have drift to parts of the tree and trunk. Injury will result.

The following write up and photos were sent to all tree fruit Extension workers in the Northeast Great Lakes Fruit Workers Group.

“Rely/Glufosinate should never be applied on apple or peach, if it is sprayed across the trunk (aka with a Phil Brown type sprayer with an offset OC nozzle that overlaps the trunk) it can and will injure trunks, especially with multiple applications even through mature brown bark. The Glufosinate compound was originally developed by Hoechst AG. It has been merged through many companies since, https://en.wikipedia.org/wiki/Hoechst_AG Currently glufosinate is marketed as Rely for tree fruit, but note that many other generic products containing Glufosinate and are on the market.”

“Dr. Brad Majek and I evaluated Glufosinate for the company on apple and peach, well over 25 years ago. Glufosinate alone injured bark and trees on mature apple and peach. See the pdf of the Rutgers Plant and Pest publication dated 6/26/2014. Please observe the photographs of peach and apple injury from our replicated trial on mature apple and peach. This work was also replicated at at least two other land grant universities at the same time period.”

“Glufosinate absorbed through the mature brown bark of the lower trunks of the trees resulted in the death of the cambium layer under the bark where the herbicide contacted the bark. Applications were made in late spring using rates and application techniques typical of orchard herbicide application. No injury was observed the year of application. The injury was observed and the trunks were photographed the following year. Other studies did not always cause trunk injury, so injury should not be anticipated every time glufosinate is used, however, the injury can be devastating.”

“Based on our replicated research with glufosinate on apple and peach it was never recommended for use in New Jersey on apple and peach and was never in our Rutgers Tree Fruit Production guide.”

I also have many photos and observations of Glufosinate injury in more recent observations of apples in tall spindle systems.

I also believe that apples that have winter cold injury are potentially more susceptible to this type of herbicide injury. See the two photos attached from 2015, mature tall spindle Fuji on M9 in Pennsylvania. There was some cold injury in the winter of 2014-15. These trees had multiple (3) applications per year for multiple years of Glufosinate, applied across the trunks/graft union with a Phil Brown type sprayer.

Glufosinate injury to apple tree where the trunk was hit with herbicide spray(s) over several years

Small Fruit Update

Sonia Schloemann

Crop Conditions: As noted by Liz above, a large area of the state has entered the ‘Abnormally Dry’ status in the Drought Monitor. Growers should be irrigating with 1”-2” per week in all small fruit plantings. Where split applications are being used, the second fertilizer application can go on now. If there is not rain in the forecast, you may need to irrigate it in. Remember not to fertilize blueberries or raspberries (especially with with Nitrogen fertilizer), after the first week of

July or late shoot growth can occur that doesn't harden off well for winter leading to a lot of winter injury. Also, don't fertilize fruiting June-bearing strawberries until renovation.
Early captures of Spotted Wing Drosophila (SWD) traps are being reported now (similar timing to last year), but no sustained captures at any location yet. This happens every year and sustained captures are the more important piece of information. We'll let you know when the start of sustained captures begins.
Strawberries: Harvest is underway on early varieties. PYO operations may open this weekend in various locations. Scouting should continue for Tarnished Plant Bug in later varieties and Two-spotted Spider Mite in all varieties. Meadow Spittle bug has been reported and is frequently found in overwintered strawberries. While they do no direct damage to fruit, they can be a nuisance and unpleasant for pyo customers. Potato leafhopper may be showing up soon. This is a more significant pest in newly planted fields and can cause stunting if present in high numbers. Secondary (or berry to berry) infections from Botrytis Gray Mold and Leather Rot may be a problem where fields are receiving a lot of overhead irrigation. Well mulched fields protect fruit from a lot of splashing that disperses spores. Drip irrigation also avoids wetting the canopy and/or splashing spores around but is less effective at delivering a lot of water if fields are approaching a drought condition. Leaf Spot may also be showing up in some susceptible varieties. Unless widespread and severe, this can wait for control after harvest.
Continue pulling blossoms off newly planted June bearing varieties as well as day neutrals (until plants have 5-6 leaves for the DN varieties) to allow them to establish strong root systems and crowns before carrying a fruit load.
Raspberries: Early Summer bearing varieties (e.g., 'Prelude') are in fruit set while other varieties are in full to late bloom now. Blackberries are in bloom to early fruitset and those on rotating trellis should be moved to the horizontal position to force flowers/fruit to one side of the trellis (North or East is best). New primocanes continue to grow well. Scout for Tarnished Plant Bug and Two-Spotted Spider Mites (especially in high tunnels). Coming soon will be Potato Leafhopper and Raspberry or Red Necked Cane Borers. Primary Botrytis Gray Mold infections occur during bloom when wetting periods occur but secondary infections can occur if wet or very humid weather occurs during ripening and harvest periods.
Blueberries: Blueberries are in late bloom to full fruit set now. As for insect pests, some leaf feeding caterpillar pests are active now. Some are hard to identify but among them is Gypsy Moth and spanworms are among the possibilities. In any case, a Bt application when caterpillars are small can arrest the damage. If left unchecked whole bushes can be defoliated. Cranberry or Cherry Fruitworm should be flying now but my traps have not yielded any captures yet. Where these pests were a problem last year, monitoring is very important for timing of spray applications. Forecasting models can predict egg laying based on first sustained trap captures, but even without traps you can estimate the timing. CBFW egg-laying is generally predicted to take place during the period of 435-750 GDD Base 50˚F from March 1. According to NEWA we are currently at approximately 462 so egg laying may have started. This means management sprays should be going on where this pest has been present in the past.
Phomopsis and other canker diseases continue to show up. Prune out dieback and remove from the field.

Other Fruit: Elderberry is in full bloom. Lingonberry is in late bloom to fruit set.
Honeyberry/Haskap are in fruit development and coloring will begin soon.
For management recommendations for any of these insect pests or diseases, refer to the 2020 New England Small Fruit Management Guide for materials and rates.

Figure 1) *June-bearing matted row fields (3 different locations), with green fruit sizing up and beginning to show some color. Photo: S. Schloemann, UMass Extension 6/4/20*

Figure 3) *Early blueberry at green fruit stage (left); 'Erntedanke' Lingonberry at fruit set (center); Elderberry at full bloom (right)* ***Photo****: S. Schloemann, UMass Extension 6/4/20*

Figure 4) *'Rovada' red currant w/ excellent fruitset (left); 'Tixia' gooseberry with fruit sizing well (center); 'Titania' black currant with good fruitset (right).* ***Photo****: S. Schloemann, UMass Extension 6/4/20*

Hawkeye's corner (notes from the field)

Liz Garofalo

Mile-a-minute has been introduced to the U.S. on a number of occasions. Existing populations are attributed to an introduction in the 1930s by way of contaminated nursery stock. The plant originates from India to Eastern Asia, China and the Islands from Japan to the Philippines, including Nepal, Burma, Manchuria, China, Korea, Taiwan and the Malay Peninsula.
Mile-a-minute rapidly grows to cover anything in its path (hence the name), restricting native plant growth by intercepting light needed for photosynthesis. There are currently 24 positive cases reported in Massachusetts. Recently the USDA has been implementing a biocontrol effort to reduce and ultimately (hopefully) eradicate this weed from the landscape and agricultural settings. Herbicides may be used to manage this weed before it grows over crops. Preventing seed formation is critical to reducing future populations. Be careful when pulling by hand as the spines harden as the plant grows and will snag you. *Trust me on this (ouch)!*

Scientific name: *Persicaria perfoliata,* Common name; Mile-a-minute weed or vine, Asiastic tearthumb. Photo taken June 8, 2020, Greenfield, MA.

Guest article

Evaluation of a grower-friendly attract-and-kill strategy for apple maggot control in New England apple orchards

Jaime C. Piñero, Anna Wallingford, and Glen Koehler

(Published originally in Fruit Notes Vol 85, Issue 2, Spring 2020)

Introduction. Previously, trap-based control strategies have focused on captures of AMF at the orchard perimeter using either, odor-baited Tangletrap-coated red spheres or odor-baited attracticidal spheres, with excellent results. The attracticidal sphere is made of a red plastic sphere topped by a disc composed of an insecticide, sugar (as a feeding stimulant) and paraffin wax (as binder). Multi-year research involving use of odor-baited sticky spheres and attracticidal spheres has clearly demonstrated the potential of controlling AMF in commercial orchards. However, several concerns have prevented the use of these devices for AMF control by commercial growers. For example, sticky spheres must be maintained at least biweekly to retain capturing effectiveness, and the labor and mess associated with handling sticky-coated traps on a large scale are prohibitive to commercial application. Unfortunately, regulatory hurdles, among other issues, have largely prevented the further research and development, leading to commercialization, of attracticidal spheres. While research involving the optimization

of attracticidal spheres continues to be conducted, it is imperative to evaluate alternative control strategies for AMF that could be implemented right away by growers.

The goal of this study was to assess the level of AMF control achieved in commercial orchard blocks using an attract-and-kill strategy involving use of synthetic lures deployed in perimeter-row trees in combination with insecticide sprays with 3% sugar added to the tank mix. Sugar is a phagostimulant that readily induces feeding by adult fruit flies upon contact. We expected to bring AMF adults to perimeter-row trees where they could be killed by the insecticide sprays, before they could penetrate into interior trees. Subsequent flies arriving to the baited tree canopies were expected to continue sensing sugar on the foliage and fruit, inducing flies to ingest insecticide residue.

Materials and Methods. This study was conducted in six commercial apple orchards (3 in Massachusetts, 2 in New Hampshire, and 1 in Maine). For each orchard, growers made two blocks available for the research. While the size of the blocks ranged from 1.7 to 5 acres (Table 1), efforts were made to have the two blocks of similar size within each orchard. Each of the four sides of a block was bordered by grower-sprayed orchard trees, open field, hedgerow, or woods. For each orchard, two treatments were evaluated (1) attract-and-kill and (2) grower control.

The attract-and-kill block made use of 5-component lures (= 'attract' component) deployed every ~30 yards along the four perimeter rows. The lures were purchased from Great Lakes IPM. The average lure density was 5 per acre. The 'kill' component of this strategy consisted of insecticide sprays mixed with 3% sugar (3 lbs. per 100 gallons of water) applied during July and August. The control block was treated by the grower most commonly with two or three insecticide sprays to control AMF. Each participant grower applied the insecticide of their choice, most commonly the organophosphate imidan (phosmet) and the neonicotinoid Assail (acetamiprid). One orchard alternated the use of Assail, the anthranilic diamide Exirel (Cyantraniliprole), and the neonicotinoid Belay (Clothianidin).

AMF monitoring. Due to logistic constraints, monitoring spheres were deployed in mid-July 2019. The attract-and-kill block received 6-8 unbaited red sticky spheres (3.5 inches in diameter) to quantify AMF densities on perimeter-row trees (Figure 1, Table 1) whereas the grower control blocks had no sticky spheres in the perimeter. Each of the two blocks received 3-4 unbaited sticky spheres in the most interior trees to monitor the degree of AMF penetration (Figure 1).

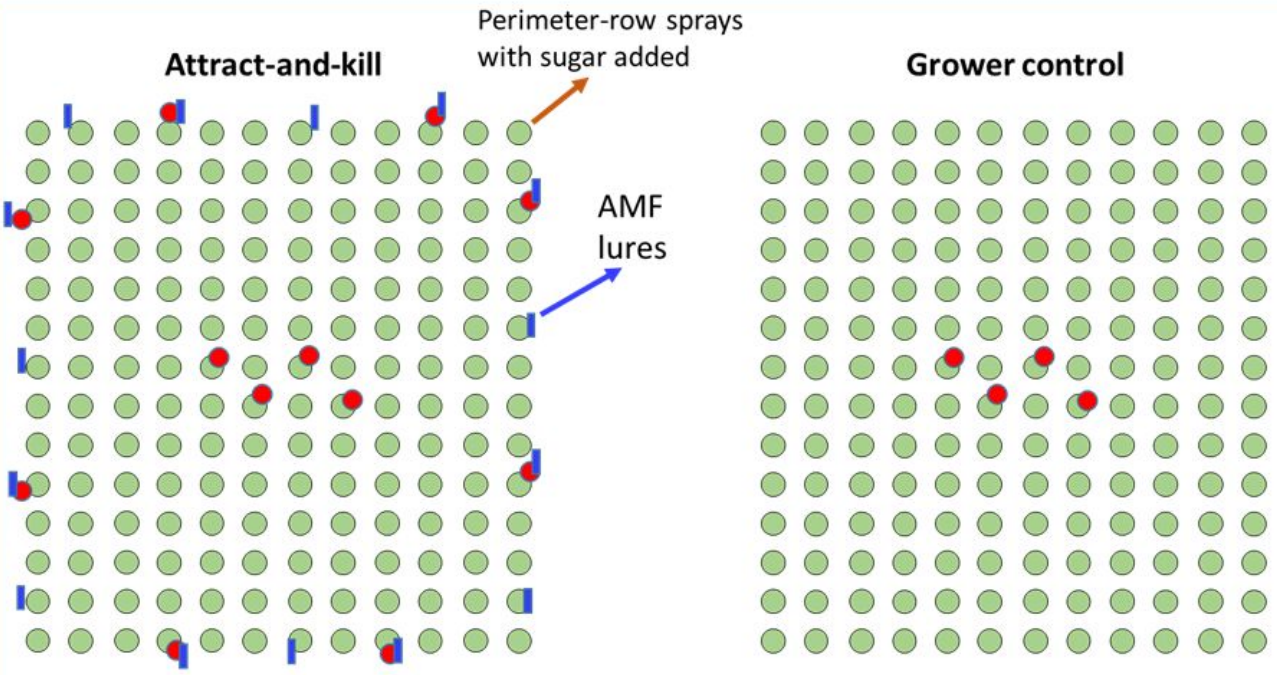


Figure 1. Schematic illustration of the 2019 field layout for evaluation of an attract-and-kill strategy for managing apple maggot fly involving use of synthetic lures (blue rectangles) deployed on perimeter-row trees in association with 3% sugar added to insecticide sprays that were confined to perimeter-row trees only. The efficacy of this management approach was compared against grower control blocks subjected to full-block insecticide sprays. Red circles: red sticky spheres. All red sticky spheres deployed in the interior of blocks were unbaited.

Assessment of treatment performance. We used two methods of assessing treatment performance. First, every week from trap deployment until harvest we counted and removed all AMF captured by the red sphere traps placed on perimeter-row trees and on interior trees of attract-and-kill plots, and by the unbaited spheres in the interior of grower-sprayed plots. Captures by interior spheres were used as an indicator of relative numbers of AMF adults that penetrated into the interiors of the two types of blocks. Second, at harvest we sampled 20 fruit from each of five trees on each of the four sides of each baited-sphere and each grower-sprayed plot plus ten fruit on each of five interior trees, for a total of 500 fruit per block. All sampled fruit that were suspected to have AMF injury upon visual inspection were brought to the laboratory (UMass Amherst), where they were kept inside individual plastic containers with moist sand (as a pupation substrate) at 70-75 degrees Fahrenheit for six weeks. Then, each fruit was dissected for signs of tunneling and/or presence of AMF pupae in the sand.

For this study to be considered successful, we expected AMF numbers on perimeter-row monitoring spheres to be significantly greater than the number recorded on interior sticky spheres of attract-and-kill blocks. We also expected no differences in the level of AMF penetration, as measured using interior unbaited spheres, into either type of block.

Results.

AMF trapping. For each trap inspection session, red sticky spheres deployed on perimeter-row trees in association with synthetic AMF lures in attract-and-kill blocks captured substantially more (9-60 times more) wild AMF than interior unbaited spheres in the same blocks (Fig. 2). This result indicated that the lures were effective at pulling AMF to perimeter-row trees. Overall, AMF captures in unbaited monitoring spheres deployed in the interior trees of both blocks were very low, and there was virtually no difference in the level of AMF pressure in the interior of attract-and-kill blocks (despite the lack of insecticides sprayed inside those blocks) and the grower control blocks (Fig 2).

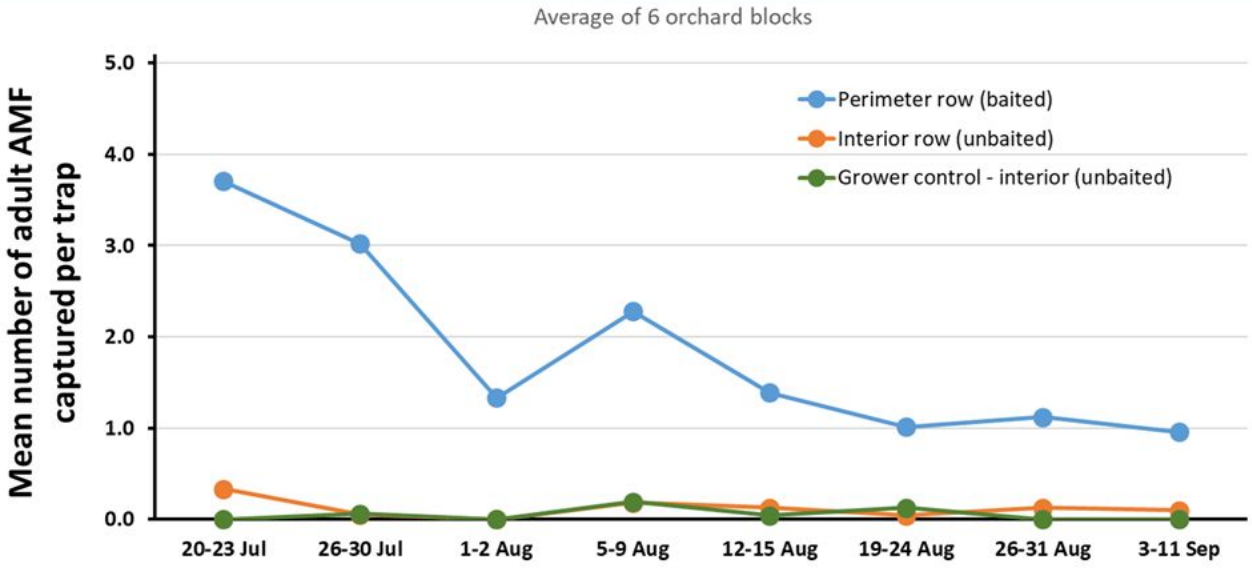


Figure 2. Weekly average captures of wild AMF in red sticky spheres deployed on perimeter-row trees (baited spheres= blue line) and on interior trees (unbaited spheres= orange line) of attract-and kill blocks. Grower control blocks had unbaited sticky spheres deployed on the most interior trees (green line).

Infestation data. The percentage of fruit that was infested with AMF larvae was statistically similar regardless of whether the fruit was sampled from attract-and-kill blocks or from grower control blocks. While some variability in results was observed, the amount of fruit injured was numerically greatest on perimeter row-trees and lowest on interior trees, for both types of blocks (Fig. 3). Because the number of AMF lures deployed on perimeter-row trees was greater than the number of red sticky-coated monitoring spheres, and therefore some trees had lures but no red sticky spheres, then the results from fruit sampling are presented separately for perimeter-row trees that harbored (or not) a baited monitoring sphere. The average percent infestation in perimeter-rows in attract-and-kill blocks was no different from that recorded in grower control blocks. The average fruit infestation recorded from interior trees was 0.18% and 0.35% for attract-and-kill and grower control plots, respectively.

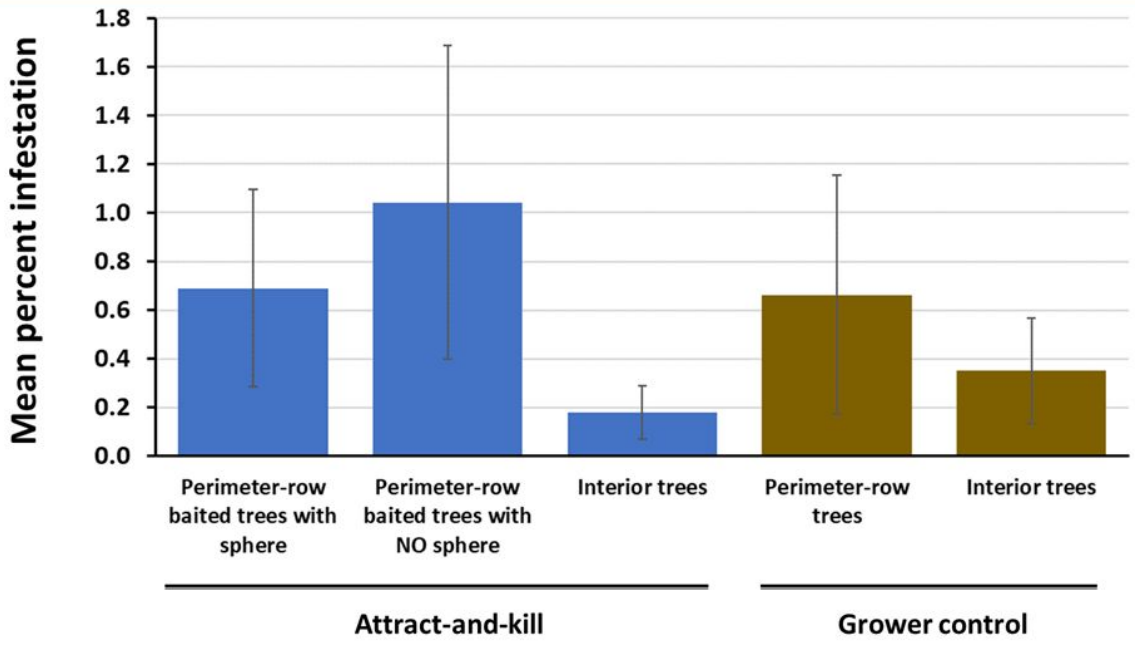


Figure 3. Mean percent fruit injured in attract-and-kill (blue bars) and grower-sprayed blocks (brown bars) in 2019.

Conclusions.Results from this single-season study indicate that an attract-and-kill approach involving synthetic lures deployed on perimeter-row trees in association with perimeter-row sprays of insecticides containing 3% sugar was effective in controlling AMF, as determined by trap captures and infestation data, when compared to grower control blocks. Future research ought to compare the performance of the attract-and-kill strategy involving perimeter-row sprays of insecticide mixed with sugar against that of perimeter trapping using odor-baited spheres in the absence of insecticide sprays. Conducting this type of research using a greater number of orchards is expected to reduce variability in results.

Acknowledgments. We thank Tom and Ben Clark (Clarkdale Orchards), Steve Wood (Poverty Lane Orchards, Lebanon, NH), Chuck Souther (Apple Hill Farm, Concord, NH), Shawn McIntire (UMass Cold Spring Orchard, Belchertown, MA), Albert Rose (Red Apple Farm, Phillipston, MA), and Harry and Sam Ricker (Ricker Hill Orchards, Turner, ME) for allowing us to work on their orchards. We also thank Isabel Jacome and Victoria Salemme for assistance. The USDA National Institute of Food and Agriculture funded this work through project 2018-70006-28890.

Facebook Me

No particular Facebook Me posts of interest this week...well there are, but I care not to share here.

Useful links

UMass Fruit Advisor: http://umassfruit.com

UMass Extension Fruit Team YouTube Channel

UMass IPM Fruit Loop Podcast

Scaffolds Fruit Journal: http://www.nysaes.cornell.edu/ent/scafolds/

Network for Environment and Weather Applications (NEWA): http://newa.cornell.edu

Follow me on Twitter (http://twitter.com/jmcextman) and Facebook (http://www.facebook.com/jmcextman)

Acimovic Lab at Hudson Valley

Peter Jentsch's Blog

The next Healthy Fruit will be published on or about June 16, 2020. In the meantime, feel free to contact any of the UMass Fruit Team if you have any fruit-related production questions.

Thank you sponsors…

Orchard Equipment and Supply Company, Inc. Conway, Massachusetts

Nourse Farms

New England Vegetable & Berry Growers' Association

Massachusetts Fruit Growers' Association