# Fruit Notes

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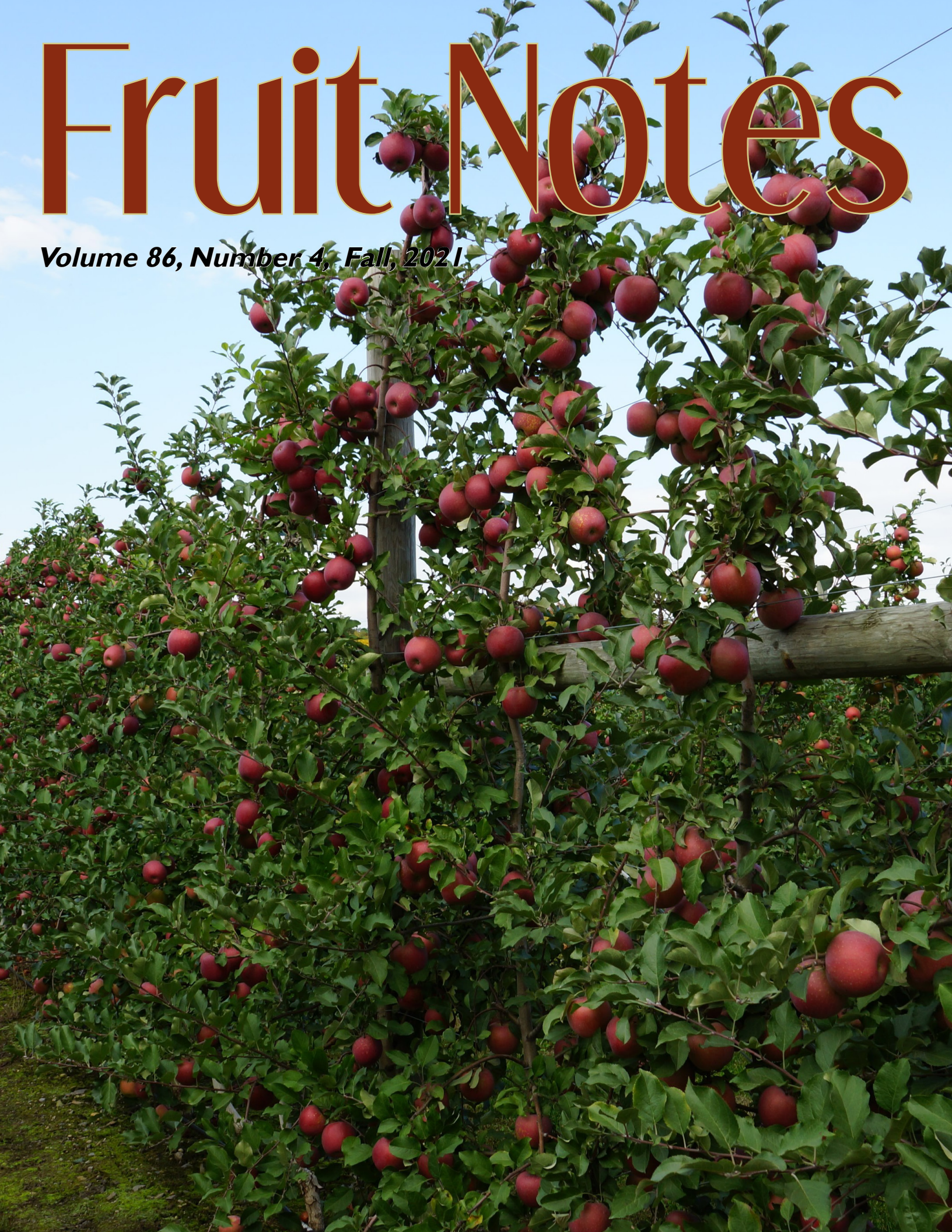

# Fruit Notes

Editors: Jaime C. Piñero & Winfred P. Cowgill, Jr.

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## Table of Contents



Cover: 4th Leaf Rosalee® (MAIA 11) Apple on G.935 rootstock at Brookdale Fruit Farm, Hollis New Hampshire www.brookdalefruitfarm.com (photo credit: Win Cowgill).

# Weather Data Source and Apple Scab DSS – Do They Make Different Recommendations?

**Jon Clements**
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***Stockbridge School of Agriculture, University of Massachusetts Amherst***

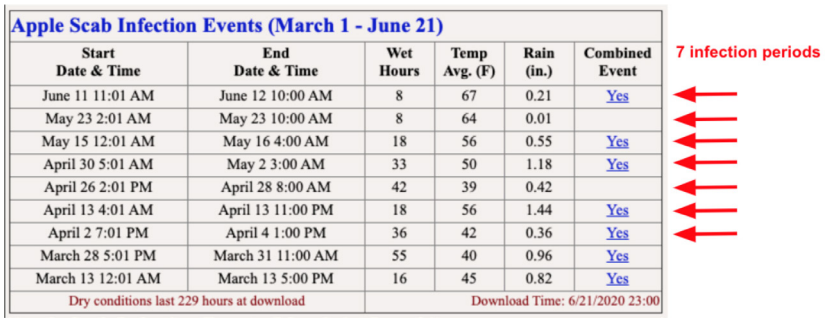
In the Northeast it is not possible to produce apples commercially without timely fungicide sprays to control apple scab. Decision Support System (DSS) models allow more targeted and potentially better scab control with fewer fungicide applications than a calendar spray schedule during the primary phase of apple scab infection. There are basically two elements that go into a DSS: weather data, and a computerized system that analyzes the data and provides user output. These basic elements vary. This raises the question, does the type of weather station, or whether it's an actual station or virtual data, or the location of a weather station, or the processing and output in the DSS itself, make a difference in predicting infection periods? To attempt to answer that question, we compared six configurations of different weather data sources, different weather station locations in an orchard, and different DSSs during the 2020 season at the UMass Cold Spring Orchard in Belchertown, MA.

Weather data was collected from four on-site weather stations at the orchard. Weather stations included two RX3000 and one U30 weather station from Onset Computer Corporation (onsetcomp.com), and one Rainwise weather station (rainwise.com). All stations were located over grass cover in relatively open areas in the orchard. Two stations (the Onset U30 and the Rainwise) were situated within 100 ft. of one another near a central block in the orchard. The other two were farther apart, one (South) at 617 ft. elevation near the center of the orchard, and the other (North) at 712 ft. approximately 0.25 miles northeast of the South station (Figure 1 and Table 1). We also looked

Figure 1. Weather station sites, Cold Spring Orchard, Belchertown, MA.

Table 1 – Information on the six configurations compared for apple scab forecasts at the UMass Cold Spring Orchard, 2020.

| Configuration | Station | DSS | Location | | | |
|---|---|---|---|---|---|---|
| | | | Site | Latitude | Longitude | Elev. Ft |
| NEWA-OU | Onset U30 | NEWA | A1 | 42º 15' 11.2" | 72º 21' 35.2" | 627 |
| NEWA-RW | Rainwise | NEWA | A1 | 42º 15' 11.4" | 72º 21' 35.3" | 627 |
| NEWA-ORX-N | Onset RX3000 | NEWA | North | 42º 15' 25.7" | 72º 21' 31.0" | 712 |
| NEWA-ORX-S | Onset RX3000 | NEWA | South | 42º 15' 14.2" | 72º 21' 39.9" | 617 |
| RIMpro-RW | Rainwise | RIMpro | A1 | 42º 15' 11.4" | 72º 21' 35.3" | 627 |
| RIMpro-MB | Virtual Meteoblue | RIMpro | A1 | 42º 15' 11.4" | 72º 21' 35.3" | 627 |



**Apple Scab Infection Events (March 1 - June 21)**

| Start Date & Time | End Date & Time | Wet Hours | Temp Avg. (F) | Rain (in.) | Combined Event |
|---|---|---|---|---|---|
| June 11 11:01 AM | June 12 10:00 AM | 8 | 67 | 0.21 | Yes |
| May 23 2:01 AM | May 23 10:00 AM | 8 | 64 | 0.01 | |
| May 15 12:01 AM | May 16 4:00 AM | 18 | 56 | 0.55 | Yes |
| April 30 5:01 AM | May 2 3:00 AM | 33 | 50 | 1.18 | Yes |
| April 26 2:01 PM | April 28 8:00 AM | 42 | 39 | 0.42 | |
| April 13 4:01 AM | April 13 11:00 PM | 18 | 56 | 1.44 | Yes |
| April 2 7:01 PM | April 4 1:00 PM | 36 | 42 | 0.36 | Yes |
| March 28 5:01 PM | March 31 11:00 AM | 55 | 40 | 0.96 | Yes |
| March 13 12:01 AM | March 13 5:00 PM | 16 | 45 | 0.82 | Yes |

Dry conditions last 229 hours at download — Download Time: 6/21/2020 23:00



Figure 2. Primary scab infection periods for a single configuration at the UMass Cold Spring Orchard, 2020 as listed in a NEWA table.

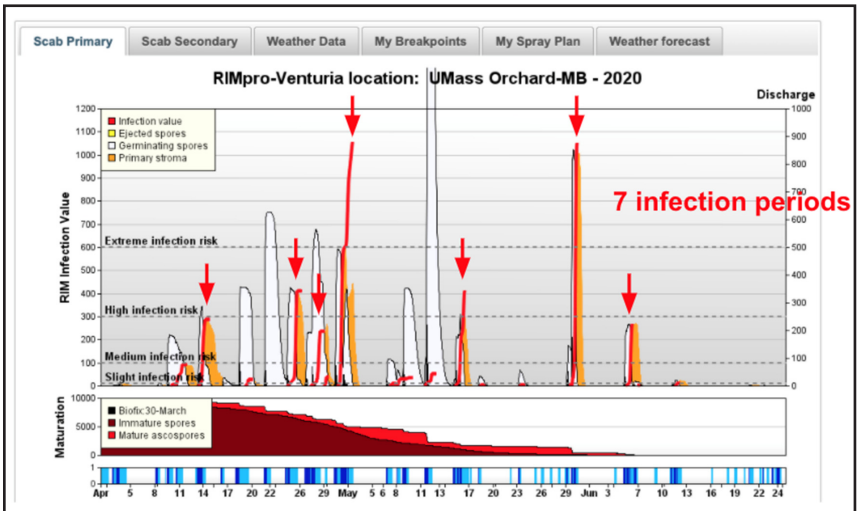



Figure 3. Primary scab infection periods for a single configuration at the UMass Cold Spring Orchard, 2020 as shown in RIMpro output by red lines that exceed 100 RIM Infection Value.

at a "virtual" weather data from a private company (meteoblue.com) which provides estimated weather data using interpolation from actual data. All stations collected temperature, wetness, and precipitation data, required to run the primary apple scab infection model.

We compared two DSSs, the Network for Environment and Weather Applications (NEWA; newa.cornell.edu) and RIMpro (rimpro.eu). The two DSSs use models based on the basic modified Mills Table for primary apple scab infection events, though they differ in terms of modifications and actual algorithms used to calculate the infection. NEWA uses an 'all or none' output to the user for a given wetting period, indicating it either was or wasn't an infection. RIMpro uses a unique calculation of the relative risk of scab infection, the relative infection measure or RIM value.

Each DSS provides output that indicates infection periods in a different format. NEWA provides a list of infection periods in a table format (Figure 2), as well as daily indications on a chart. RIMpro provides a graph that indicates infections when a red line exceeds a certain 'RIM' value (Figure 3). In this study, we used a RIM value of 100 as the threshold for an infection. These infection periods were summed for each of the six configurations and are shown in Table 2.

All apple scab primary infection periods were evaluated in each system as graphically illustrated in Figure 4. Each cell in the table represents a day. Red color-filled cells with an 'x' in them are scab infection periods. Yellow color-filled cells indicate when a grower would probably apply a fungicide spray to manage an infection, a potential spray. Potential sprays were determined using two simple rules: 1) apply a preventive fungicide spray before every infection event; 2) apply a post-infection (kickback) spray following infection periods with wetting that extends more than 48 hours, and/or when ascospore maturity development increases available ascospores by more than 1%.

We first looked at four configurations at the same site, A1. Primary infections ranged from three events

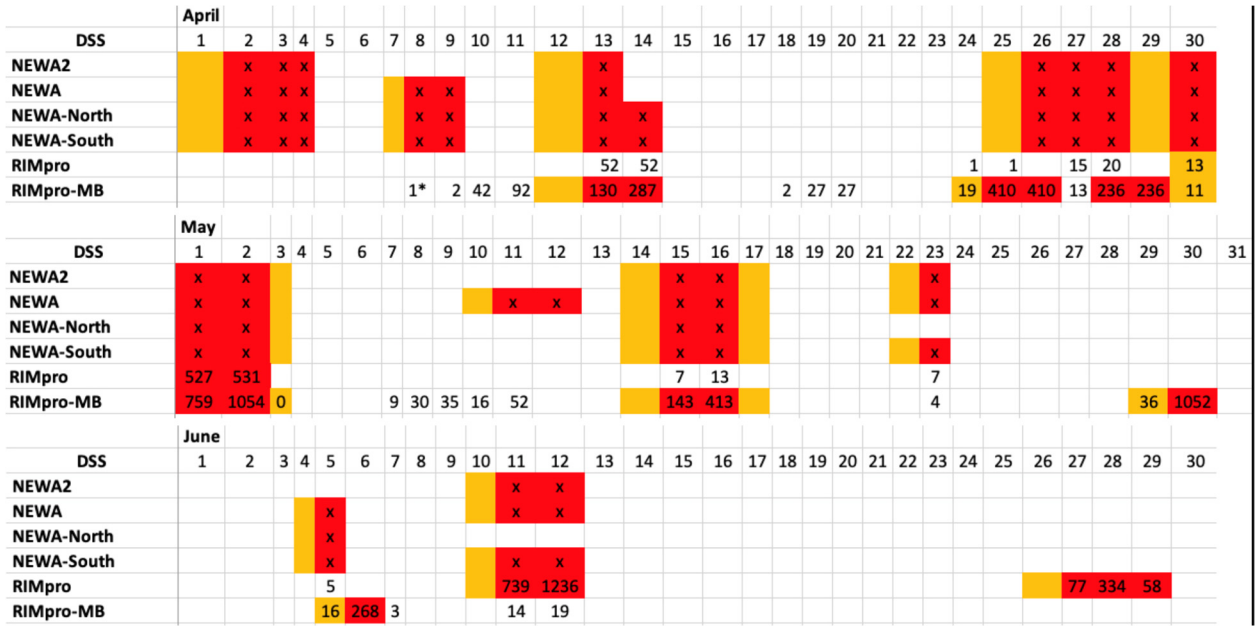



Figure 4. Grid showing primary infection periods (red blocks with an 'x' or RIM value) and potential fungicide sprays (yellow blocks).

for the RIMpro-RW configuration, to ten infections for the NEWA-OU configuration, with NEWA-RW and RIMpro-MB, each showing 7 infections (Table 2). Spray events ranged similarly. This pattern suggested that either weather station site or the DSS used, or both, could contribute to the differences. Comparing each of the two configurations using the same DSS, NEWA or RIMpro, at site A1, there were big differences within each pair, indicating stations can cause differences. Comparing the one pair using the same station but a different DSS, there are also differences. So either or both of these factors, DSS and station, can create differences in scab recommendations.

One pair of configurations, NEWA-ORX-N and NEWA-ORX-S, used the same station hardware and DSS, but were at sites in the orchard that were about 0.25 miles and 85 ft. elevation apart. The infection events and potential sprays differed between these sites, not a surprise. They also differed from events and sprays in the other configurations.

Finally, looking at the three configurations with the same number of infection events, 7, they differ in terms of station, DSS and site, and potential sprays are similar, ranging from 7 to 9. This suggests that any configuration yields similar management decisions. However, in the context of the other data, it is clear there are differences across configurations. The similar results in these three configurations may happen because the variability introduced by the different components cancels out.

The differences we saw are concerning and could result in a grower taking inappropriate management actions, resulting in undesirable outcomes, such as a scab outbreak or making more fungicide applications than necessary. This of course was a preliminary comparison. We need to do further comparisons, and perhaps more importantly, link recommendations from each configuration to actual fungicide applications, to get a better idea of how to best configure a DSS system in orchards. It is clear, however, that significant differences exist between configurations, and these may translate to either overapplication of fungicides or worse, apple scab outbreaks.

Table 2 - Total number of apple scab primary infection periods and potential fungicide sprays during the primary apple scab season by the six DSS configurations.

| Configuration | Infection Periods | Potential Sprays |
|---|---|---|
| NEWA-OU | 10 | 12 |
| NEWA-RW | 7 | 8 |
| NEWA-ORX-N | 7 | 9 |
| NEWA-ORX-S | 9 | 11 |
| RIMpro-RW | 3 | 3 |
| RIMpro-MB | 7 | 7 |

Figure 5. Early apple scab infections on a young apple leaf.

**Brookdale Farm Supplies is pleased to announce distribution agreement with Valente corporation in the United States for apple and grape trellising systems**

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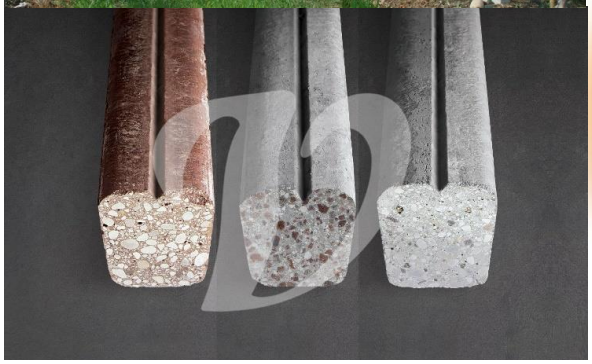

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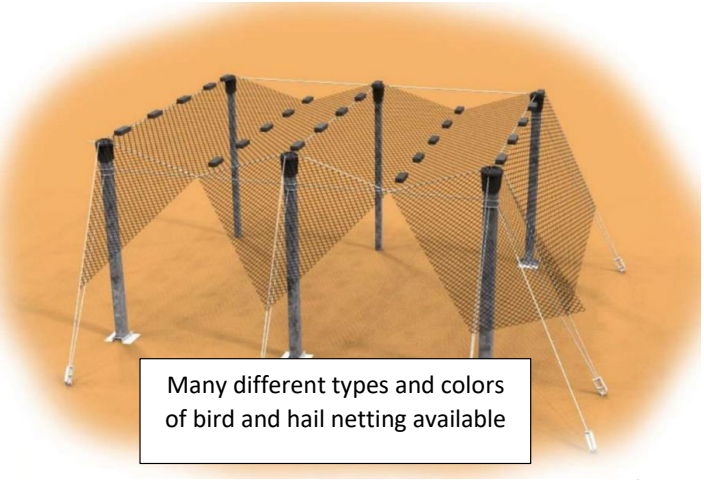

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# Orchard Weed Management Survey Results and Herbicide Alternative Management Strategies Review

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***University of Massachusetts Extension***

At the 2019 Extension Implementation Program advisory group meeting, weed management was listed as a top priority of fruit and vegetable growers and Agricultural service providers. To establish an understanding of knowledge gaps in weed management, a weed identification quiz was administered to growers attending a weed management session at the New England Vegetable and Fruit Conference in Manchester NH, Dec. 10-12, 2019. Overall, most participating growers in the audience were able to correctly identify most of the weeds presented to them, however, depending on the weed in question, as high as 35% percent of respondents replied with "I don't know" (for more details on the results from this quiz, see the winter 2020 issue of Fruit Notes).

The next step in this weed management knowledge gap assessment process was to create and administer a second survey designed for commercial fruit growers in the northeast intended to elicit specific management concerns. In July 2021, this survey was sent out to the Fruit Team's Healthy Fruit newsletter mailing list, The Grape Notes mailing list, The Vegetable Team's Vegetable Notes newsletter mailing list and was distributed in paper form at the Massachusetts Fruit Growers Association summer meeting.

## *Survey Results*

Forty-two surveys were completed by fruit growers. Most respondents (81%) were Massachusetts growers. Other states represented in the survey responses were: NH, (10% of respondents) CT (5% of respondents), and VT and ME (2% of respondents, respectively).

Of the crops grown by respondents, apple was most common followed by peach, pear, cherry, raspberry, blackberry, blueberry, grape, and strawberry (Figure 1.). Other crops reported were: paw paw, persimmon, plum, apricot, cranberry, Christmas tree, corn, squash, "veggies" (one report of each), tomatoes (2 reports) and pumpkins (3 reports). It is no surprise that growers with perennial crops have the most difficulty managing perennial weeds. More respondents listed managing perennial broadleaf weeds as being their greatest weed management challenge than any other weed type or class (Figure 2).

Overall, most growers who answered questions in this section stated they "never" use: organic herbicides; wood chip, plastic, or straw mulch; cover crops or mechanical cultivation. Hand weeding was the most widely used non-herbicide weed management method with 68% of respondents stating they used hand weeding at least some of the time. Of these, 11% rated this method as highly effective, 21% as not very effective, and 42% landed somewhere in the middle. Weed management strategies listed by growers in "other" category included: pre and post emergent herbicide programs, wood chip, cellulose, crushed stone and straw mulches, weed "whacker" and DR trimmer (author's personal note: the DR trimmer looks like a promising tool to have in an orchard, perhaps worth researching).

Of the 42 total survey respondents, 10 provided written responses to the question "Moving forward, what research and/or information would be most helpful for weed management in your orchard, farm, vineyard (i.e., mulching, weed identification, weed management and vole habitat, herbicide resistance, etc.)?" (1) Eight of 10 listed weed identification as important information for them to acquire in the future. Two proposed photo identification resources. (2) Six of 10 listed mulch as an important research area for the future. (3) Two respondents expressed concerns regarding vole habitat. (4) Other responses varied but could most logically be categorized into (5) herbicide considerations and (6) specific weed issues (i.e., bittersweet, bindweed, etc.). There were two outlying responses that could not be readily categorized with others which were: "organic weed treatment" and "None, all un-

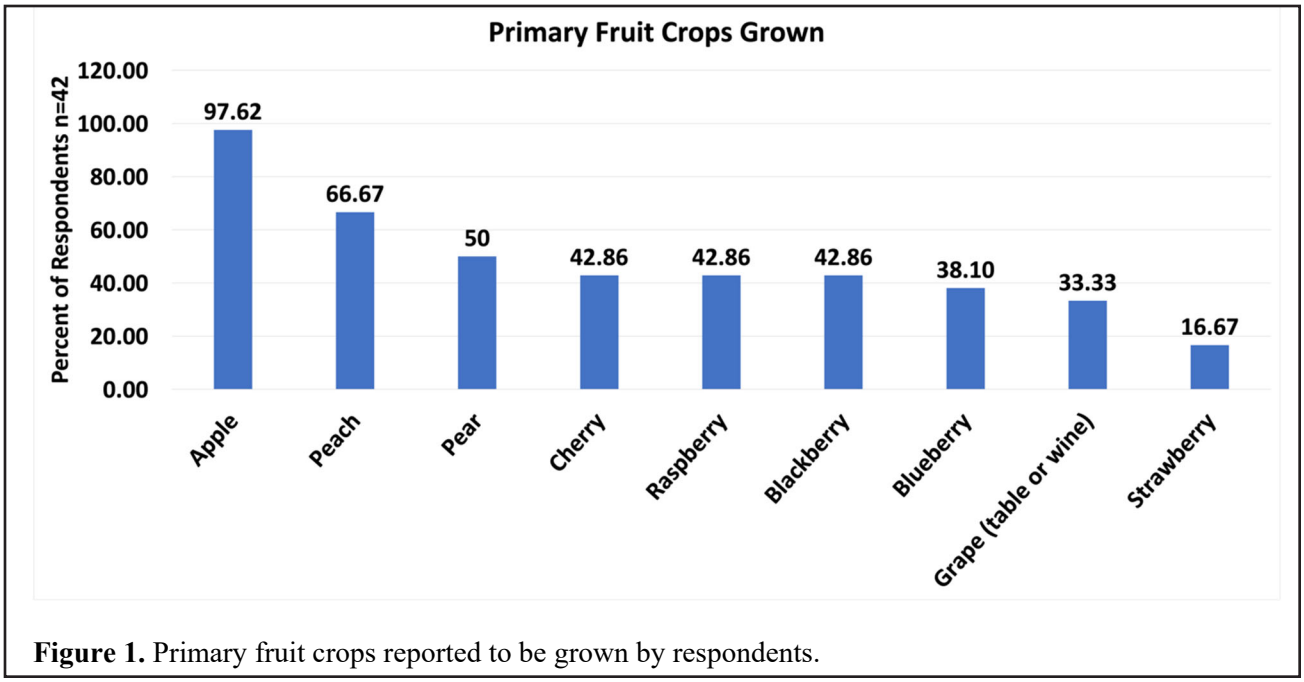


**Figure 1.** Primary fruit crops reported to be grown by respondents.

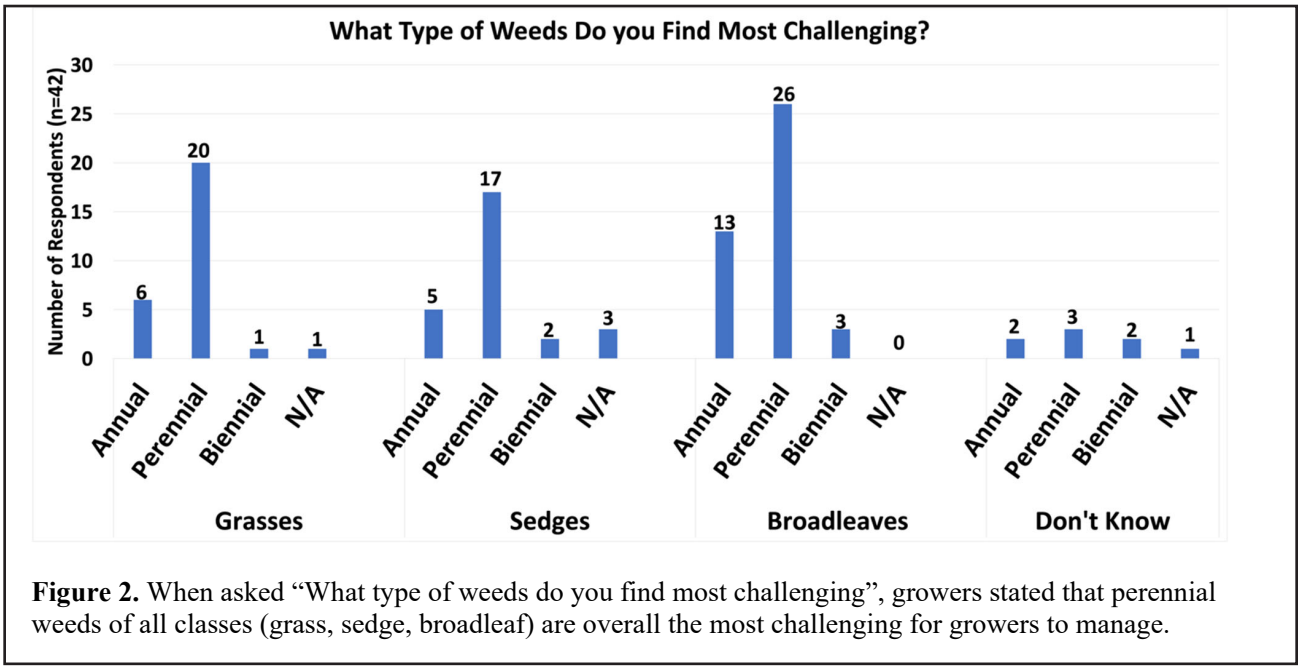


**Figure 2.** When asked "What type of weeds do you find most challenging", growers stated that perennial weeds of all classes (grass, sedge, broadleaf) are overall the most challenging for growers to manage.

der control for the most part, just spray herbicides."

The main goal of this article is to provide information to growers on weed identification resources and non-chemical weed management in orchards based on identified weed-related concerns. Additionally, given the known potential for management practices that do not leave a bare earth strip within the tree row to provide habitat for voles, this article will also discuss potential for alternative management strategies to foster these destructive pests.

## *Weed Identification Resources*

47% of respondents stated they were "somewhat" or "not at all" confident in their ability to identify weeds as annual, perennial or biennial. 56% of respondents stated they were "moderately" or "very confident in their ability to identify a weed as "grass", "broadleaf" or "sedge". Understanding which weeds are present when, life cycle (i.e., perennial, annual, biennial) and growth habit increases a grower's ability to effectively imple-

ment weed management strategies. Many resources both print and online, exist to aid in identifying common weed species. UMass Extension's Landscape, Nursery and Urban Forestry Program is home to the UMass online Weed Herbarium. This collection of weed photos is listed alphabetically and can be searched by common name, scientific name, or by family name. The UMass Cranberry Station has developed a weed identification book which can be ordered by emailing: cranberry@umass.edu. MyIPM, a smartphone app, has begun development of a weed management category which currently contains photo identification of more than 35 weed species. This app can be downloaded for Android or iOS in the app store. Finally, and possibly most widely used, Weeds of the Northeast contains a key to identifying weeds, photos and growth habit descriptions and can be purchased through Cornell University Press.

## *Management Strategies- A Brief Review*

### Effect of non-herbicide Ground Management Systems (GMS) on Weed Suppression

*Bark Mulch*

• Bark mulch, applied at a depth of 4"-6" depending on the study, has been found to suppress weeds adequately for a two-year period (Peck et. al. 2011, Granatstein and Mullinex 2008, Atucha et. al. 2011) but typically requires reapplication on the third year regardless of mulch depth.
• One study found that after the fifth year in a 16 year-long study, spot applications of glyphosate were necessary in bark mulch treatments to suppress emerging perennial weeds.
• Another study observed weeds growing up in and around mesh mouse guards deployed in mulch treatments and suggested that either spot herbicide applications or hand weeding would be necessary to mitigate the issues (i.e., borers) associated with weeds growing in such proximity to tree trunks.

*Soil surface cultivation*

• Mechanical cultivation (tillage) within tree rows was found to be effective at suppressing weeds for two to four weeks after each time this practice was performed in the orchard.
• Depending upon the study, this practice was performed 3-4 times per season between May and mid-July to August.

*Synthetic mulches*

• Polypropylene and other weed fabric type materials were not found to be as effective at suppressing weeds as either mulch or soil surface cultivation.
• Polypropylene treatments often had weeds break through the material, requiring periodic hand weeding.

*Living mulches*

• In the early years of a planting, living mulches create the same competition issue within row as any weed cover.
• While these living mulches may suppress other weeds, they can become the weed themselves.

### Effect of non-herbicide GMS on Vole Activity

• When considering mulch as a weed management option, many anecdotal comments can be found stating a connection to mulch and increased vole damage. However, very little research is available to support these statements. Merwin et. al. (1995) installed mouse guards in all GMS treatments, and still observed vole activity and tree damage in mulch/ground cover treatments at one study site. At the other site in the study, however, they did not observe this same level activity suggesting that vole populations and subsequent damage can be site specific and influenced by factors other than GMS (predator populations, etc.).

*Bark Mulch*

• Merwin et. al. (1995) reported variability in vole populations and activity from year to year and site to site but reported that there was more damage in mulched plots than herbicide treated plots, especially in synthetic mulch plots. However, less damage was reported in wood chip mulch plots than other biomass mulches.
• Other studies have shown that wood chip mulch exhibits the same low level of vole activity and damage as clean cultivation supporting observations that voles do not move well through this material (Wiman et. al. 2009).

*Soil surface cultivation*

• Clean cultivated in row treatments experienced overall less vole activity as this practice removes all cover and attractive food sources (outside of trees) from the orchard rows.

*Synthetic mulches*

• Synthetic mulches appear to provide the greatest cover for voles as they can easily tunnel and nest underneath these (Image 1) remaining hidden from predators while feeding on roots and unprotected trunks.

*Living mulches*

• Wiman et. al. (2009) studied the effect of living mulches on vole activity in orchards in Washington. In their first year of study vole populations were sufficient to determine that these types of mulching systems provided ideal habitat for voles recording greater activity and tree damage. The second and third years had very low overall vole populations and a such were unable to draw significant conclusions regarding the level of activity and damage.

*Additional note:*

• Granatstein and Mullinex (2008) found that "Wood chips led to a 20% to 30% savings in irrigation water". As rainfall becomes more sporadic, this is likely to be a useful water conservation service.
• Wood chip mulch source and composition is an important factor. The potential for importing weed seeds exists.

## *Conclusions*

• Herbicides continue to offer growers the least expensive weed management option. However, with the demand for fruit grown using fewer synthetic inputs, wood mulch presents an interesting, potentially viable addition to the weed management program implemented in tree fruit in Massachusetts. More long-term research into the impact that this practice has on vole activity and damage is needed.
• Merwin et.al. (1995) estimated that cost of herbicides and wood chips was similar- $200-$400 over three years for herbicides and $70-$350 for wood chips (sourcing varies by region, this study was able to pick up you-carry mulch for free at the municipal lot, hence the lower end of the cost estimate). An updated cost analysis of this data is necessary given the overall increase in agricultural supply prices.
• Given the findings in the above-mentioned studies, living mulches and synthetic ground covers are not currently a viable herbicide alternative for tree fruit production.

## *Additional resources*

UMass Extension Landscape, Nursery and Urban Forestry Program.

UMass Extension Landscape, Nursery & Urban Forestry Program Weed Herbarium

UMass Cranberry Station

UMass Cranberry Station Fact Sheets

Weeds of the Northeast

## *Acknowledgements*

Thank you to all of you who took the time to fill out this survey! This work was supported in part by funding provided by USDA NIFA Extension Implementation Program, Award No. 2017-70006-27137.

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# Assessing the incidence and abundance of Rosy apple aphid infestation at the UMass Cold Spring Orchard in 2021

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Rosy apple aphid (*Dysaphis plantaginea*; RAA) is the most destructive aphid pest of apple in many regions of North America. This aphid feeds mainly on apple foliage, notably fruiting spurs, causing leaf chlorosis and severe leaf curling (Figure 1). RAA feeding indirectly stunts and deforms fruits in the cluster. RAA overwinters on apple trees as eggs laid on twigs, bud axils, or in bark crevices. The overwintering eggs give rise to only female aphids which give birth to live young. Shortly after silver tip the eggs hatch. The aphids continue to reproduce on apples until summer, then winged forms are produced which migrate to other hosts such as dock and narrow-leaved plantain to spend the summer. In the late fall, winged forms migrate back to apples and lay eggs in bark crevices and on twigs. Cortland, Idared, and Golden Delicious are the most susceptible cultivars to RAA injury. A cool, wet spring favors aphid development by providing conditions unfavorable for aphid parasites and predators.

RAA numbers can vary considerably from year to year, so this aphid species may not be a pest every

**Figure 1.** Shoot terminal infested with Rosy apple aphid (RAA) and RAA females with progeny.

**Figure 2.** Early-season infestation by RAA at the UMass CSO Orchard in 2021 (picture credit: Jon Clements).

year. In recent years, however, RAA populations seem to be gradually increasing in some orchards in Massachusetts. In 2021, outbreaks of RAA were reported in various apple orchards throughout Massachusetts and adjacent states. At the University of Massachusetts Cold Spring Orchard (CSO), infestations of RAA were first detected in April 2021 (Figure 2). No pre-bloom insecticides were sprayed at CSO. Insecticides applied with the delayed dormant oil application have historically been used for control of RAA, but control is best accomplished from the tight cluster to pink stages.

The main goal of this study was to quantify the level of RAA infestation in terms of both incidence (expressed as the percentage of shoot terminals infested with RAA) and aphid abundance, in 8 apple blocks at CSO. We also quantified the abundance of natural enemies and the level of RAA mortality attributable to insecticide sprays that targeted plum curculio (PC) at the time of petal fall, which took place ca. 10 days before the RAA assessments.

## *Materials & Methods*

**Study site. This study took place at the UMass CSO, in Belchertown, MA, on May 28, 2021. Eight apple blocks were used for the assessments.**

**Foliage sampling**. A group of four people received training on identification of RAA injury to apple foliage. For each of the 8 sampled blocks, 100 shoot terminals (5 shoot terminals per tree, 20 trees per block) were visually inspected for symptoms of RAA infestation. To avoid visual bias, the observers positioned themselves in front of trees and without looking at the foliage they pointed to an area within the tree canopy. The terminal shoot closest to the blindly-chosen area was inspected. Data recorded were used to calculate the percentage of shoot terminals that were infested with RAA, a parameter known as incidence of infestation.

In addition, three terminal shoots infested with RAA were removed from 20 trees per block using scissors. Those three samples of foliage per tree were placed inside zip-lock bags labeled with information about block, row, and cultivar. For the analyses, explicit cultivar information is presented in some cases. In some blocks with highly mixed cultivars, this type of information was not collected for every single cultivar that was sampled and therefore we are referring to such blocks as 'Mixed1' (predominant cultivars: Ginger Gold, Gala, Zestar, Silken, Pink Lady, McIntosh), 'Mixed2' (predominant cultivars: Mutsu, Spigold, Northern spy, Idared, Golden Delicious, Jonagold, Golden Russet, Empire, Jonathan, Red Delicious), 'Mixed3' (predominant cultivars: Gala, Fuji, Red Delicious, Golden Delicious, Macoun, and McIntosh), and 'Mixed4' (predominant cultivars: Golden Delicious, Pazazz, Ambrosia, Gala, Fuji, and Honeycrisp).

**Processing of foliage samples**. All foliage samples were taken to the UMass campus laboratory. One randomly selected leaf from each infested terminal shoot was inspected under a stereomicroscope and the total number of RAA (dead and alive) was recorded. We also recorded natural enemies present in the samples that were examined. Sixty leaf samples per block were inspected.

**Effect of insecticides applied against PC (not against RAA)**. On May 17, 10 days before conducting the RAA assessments, insecticides targeting PC were applied to all blocks at CSO (i.e., petal fall spray). Because different blocks received different insecticides, then this report also presents RAA mortality results that are attributable to the petal fall spray that targeted PC. More specifically, the insecticides sprayed against PC on May 17 were Imidan (active ingredient: Phosmet, IRAC group 1B), Avaunt (active ingredient: Indoxacarb, IRAC group 22), and Verdepryn (active ingredient: Cyclaniliprole, IRAC group 28). For details about the performance of Verdepryn to control PC when compared to Avaunt, see the Summer 2021 Issue of *Fruit Notes*.

## *Results*

**Incidence of RAA infestation.** The cultivar with the highest incidence (expressed as the percent of infested terminal shoots) of RAA was Cortland (25% of the terminal shoots were infested, on average) (Figure 3), followed by a mixture of cultivars present in the block 'mixed4' (18% RAA infestation, on average) which included the cultivars Golden Delicious, Pazazz, Honeycrisp, Gala, and Ambrosia. These cultivars are known to be relatively attractive to RAA. Third in ranking was the 'Mixed3' block (14% RAA infestation), which contained relatively attractive cultivars such as Gala and Golden Delicious and less attractive cultivars like McIntosh and Macoun. The least susceptible cul-

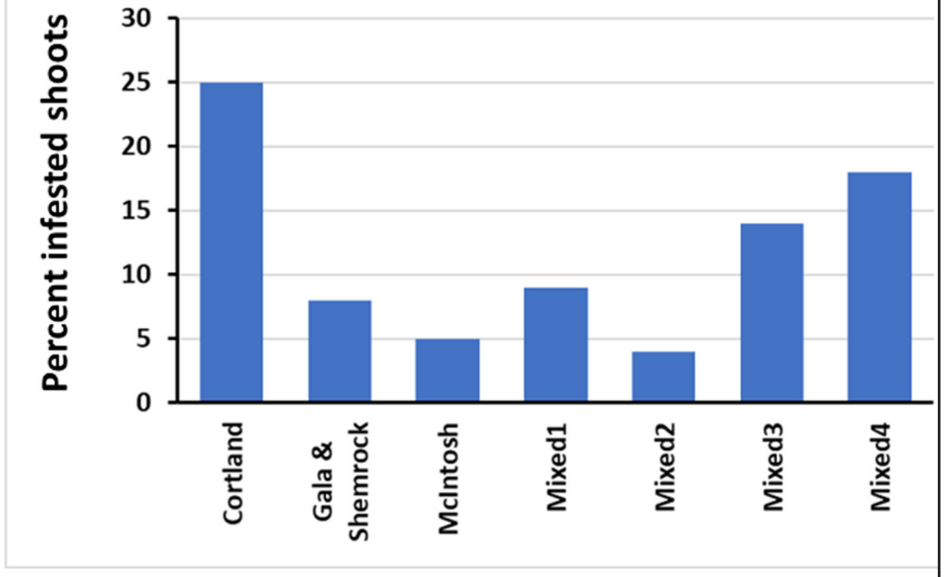



**Figure 3.** Percentage of shoot terminals that were infested with RAA. For each of the 8 blocks, 100 shoot terminals (5 shoot terminals per tree, 20 trees per block) were visually inspected for symptoms of RAA infestation. Results are presented according to cultivar, except for the highly mixed apple blocks.

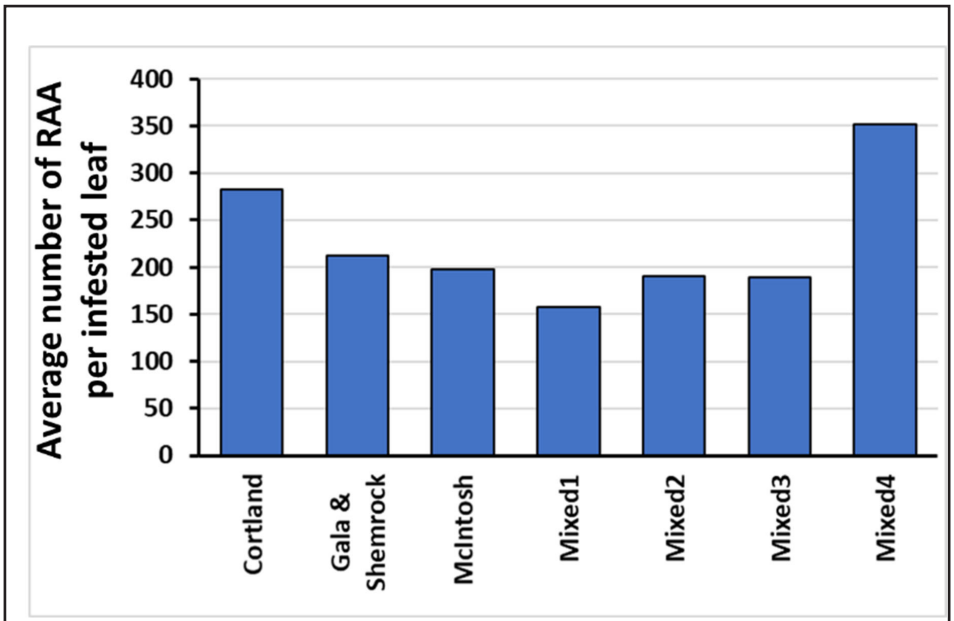



**Figure 4.** Average abundance of RAA in one randomly selected leaf from each infested terminal shoot. In all, 275 apple leaves were inspected under a stereomicroscope and the total number of RAA (dead and alive) was recorded

tivars to RAA were in the 'Mixed2' block (4% RAA infestation), and McIntosh (5% incidence of RAA). The former block had a high diversity of cultivars that included Mutsu, Spigold, Ida Red, Golden Delicious, Jonagold, Empire, and Red Delicious, among others.

**RAA abundance**. Across all sampled blocks, 56,413 RAA were counted on sampled leaves. The greatest abundance of RAA was recorded in the 'Mixed4' block, which included the cultivars Golden Delicious, Pazazz, Honeycrisp, Gala, and Ambrosia, among others. In this block, each sampled leaf that was infested with RAA had 350 aphids, on average, across all sampled leaves (Figure 4). Despite the comparatively high abundance of RAA, no sooty mold was observed neither on foliage nor fruit at the time of the observations. At CSO, RAA caused significant fruit deformity where present and resulted in economic loss in yield in susceptible varieties (Figure 5).

**Presence of natural enemies.** The number of natural enemies (Figure 6) found attacking RAA in four sampled blocks was very low. Percent parasitism by wasps (family Braconidae) ranged from 0.21% (2 wasps per 1,000 RAA) to 0.34% (3 wasps per 1,000 RAA). Hover fly larvae (family Syrphidae) ranked second, with densities ranging from 0.03% (equal to 3 lacewing larvae per 10,000 aphids) to 0.12% (1 lacewing larva per 1,000 RAA). Lady beetle larvae/adults (family Coccinellidae) were also present, but in even lower numbers.

**Figure 5.** RAA feeding injury to developing apple fruit (picture credit: Jon Clements).

**Level of RAA control achieved with the petal-fall insecticide spray against plum curculio (PC)**. Because in addition to recording the number of live RAA on each sampled leaf we also recorded the number of dead aphids (not showing signs of predation), we are attributing the mortality observed to the effect of the insecticides that were sprayed against PC 10 days before the RAA assessments. As a reminder, the insecticides that were applied against PC (not RAA) were Imidan, Avaunt, and Verdepryn and the targe species was not RAA. For more information about the excellent performance of Verdepryn when applied at petal fall to control PC see the Summer 2021 Issue of *Fruit Notes.*

The overall level of RAA mortality that can attributed to insecticides sprayed at petal fall (on May 17) against PC was 8.3%. Imidan achieved 17.2% mortality of RAA, whereas Avaunt and Verdepryn led to 9.5% and 7% mortality of RAA, respectively.

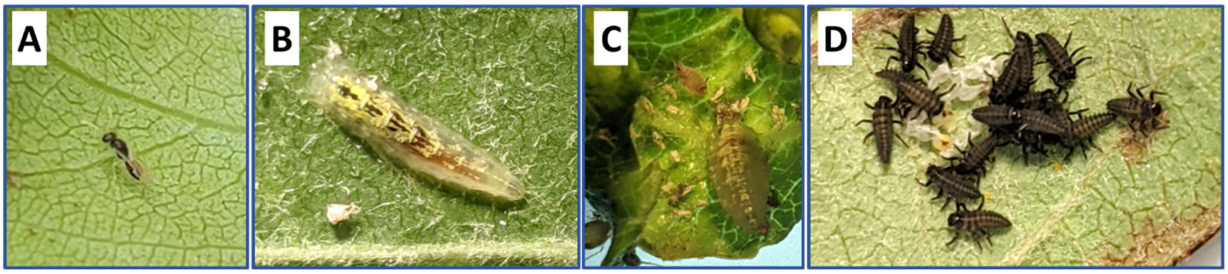



**Figure 6.** Natural enemies identified during apple foliage sampling: (A) parasitic wasp, (B) hover fly larva, (C) lacewing larva, and (D) lady beetle larvae.

## *Conclusions*

Rosy apple aphid was most prevalent in Cortland and in blocks having mixed cultivars that contained attractive cultivars such as Gala, Honeycrisp, and Golden Delicious. The least susceptible cultivar was McIntosh. RAA highest densities were recorded in the 'Mixed4' block as a whole, which included the cultivars Golden Delicious, Pazazz, Honeycrisp, Gala, and Ambrosia all of which are attractive to RAA. The second highest RAA densities were recorded in Cortland. Very low numbers of natural enemies were found. Timely monitoring and pre-bloom application of aphicide, if needed, are IPM tactics that ought to be implemented in 2022.

## Acknowledgments

We thank Prabina Regmi, Jaelyn Kassoy, and Ajay Giri for technical assistance. Funding for this research was provided by the UMass Stockbridge School of Agriculture.

# Fall Weed Control in Apple and other Tree Fruit Crops

**Win Cowgill**
***Professor Emeritus Rutgers University, Win Enterprises Int., LLC.***

### *Fall Weed Control*

Late October, early November after apple harvest is complete is an excellent time to apply post emergent herbicides to apple and all tree fruit crops.

Note the recommendations and materials listed in this article are for NJ growers. Growers in other states including Massachusetts must check their state labels to make sure the herbicides discussed are labeled in your state.

For over 35 years Dr. Majek and I have promoted the use of spilt preemergent applications in orchards; spring and fall. The split applications, beginning in the fall give us more breathing room in the spring to control germinating weeds. If weather or soil conditions are not conducive for a spring application in late March we have bought time with our fall application, to hold us until the end of April.

- There is no substitute for a good pre-emergent weed control program consisting of both broadleaf and grass pre emergent materials applied in a split application both spring and fall.
- Note a combination of a broadleaf and grass preemergent herbicides must be used. Some herbicide products have overlap between control of broad leaf weeds and grasses but one of each type of preemergent should be combined for the widest range of weed species control.
- Know your weed species you are trying to control; this will let you better match the materials you select for your pre-emergent herbicides.
- All pre-emergent herbicides work best when applied to bare weed free soil.
- All newly planted trees should be protected with a non-porous tree guard or white latex paint. I used to use blank milk carton blanks but you only get 2 years from them, you need protection through year five.
- I like more and more painted new tree trunks with full strength white latex paint. You protect against herbicide, rabbit and mice and you get south west cold injury protection.
- I have one grower solution cost effective, using 4 inch black corrugated drainage tile, bought in 100 foot lengths or more, cut to length and slit on one side, slips right on trunk.
- Note: Trees planted in 2021 should have trunk protection for this fall application.
- All herbicide spray water should be buffered and pH adjusted to 7.0 or lower. Higher pH's can deactivate the herbicide and cause failures
- In a perfect world all perennial weeds are controlled one to 2 years prior to orchard establishment. Perennial weeds are best controlled in September prior to planting, if systemic herbicides are used in September in existing orchards the trees are highly susceptible to injury!
- Apply all herbicides with low pressures 20-25psi and use nozzles that produce large droplet sizes no minimize drift.
- There is much interest in air induction nozzles for herbicide application for this reason.

***Boron*** – all apple fall herbicide applications should also include one pound of actual Boron per acre. Boron leaches very easily and is essential to apple. It should be added annually.

### *Fall Tree Fruit Pre-Emergent Herbicide Options for Apple*

### *For Grass weeds*

- Prowl H2O (pendimethalin)
- Solicam DF (norflurazon)
- Surflan (oryzalin) note has been unavailable the last 2 years

**Specialized Fall Grass Materials**

- Kerb (pronamide) – for established stands of grass under the tree in the herbicide strip- works as a pre and post emergent herbicide- Rate is dependent on soil textural classification, works on many annual and perennial grasses- see the label

## *For Broadleaf Weeds*

**Trees less that one full year (planted this spring)**

- Gallery or Trellis 4.16SC-(isoxaben) can only be used on newly planted trees-non bearing trees
- Chateau 51S- (flumioxazin) no more than 6 ounces, trunks must be protected. Chateau does have post emergent activity and works better if applied on bare soil.

**For trees 1-3 years old**

- Chateau 51SW (flumioxazin) – 6 ounces/A- trunks should be protected
- Princep 4L--(simazine)- established trees 1 year and older -150 day PHI should only be used as option in fall
- Karmex (diuron)- established trees 1 year and older
- Casoron CS- (dichlobenil)- for well established plants more than one year after transplanting

**Trees Established 3 years or More**

- Chateau 51S- (flumioxazin) no more than 6 ounces, trunks must be protected. Chateau does have post emergent activity and but as a pre-emergent it works better if applied to bare soil.
- Princep 4L-(simazine)- established trees 1 year or older
- Alion 1.67SC (indaziflam) - established 3 years or more- note the soil texture and gravel cautions and rates
- Zeus Prime 3.5 XC- (carfentrazone + sulfentrazone)- helps control nutsedge and is long residual
- Casoron CS- (dichlobenil)- established trees 1 year after transplanting- read the weeds controlled, hits some perennials other products miss

## *Post Emergent Not Selective*

- 2,4-D amine- controls broad leaf weeds only- Probably one of the easiest on tree trunks
- Embed 3.8SL- new form of low volatility 2,4D (2,4-D choline)

https://www.canr.msu.edu/news/new-24d-formulation-offers-greater-safety-for-berries-tree-fruit-nut-tree-crops

- Gramoxone SL) 2SL (or generic paraquat)- non selective, grass and broad leaf weeds if still green- more restrictions on application make it tougher to use for the grower. Since we must add surfactants to Gramoxone trunks should be protected especially trees in the first 3 years in the orchard.
- Glyphosate- **spot treatments only this time of year**, after June 21, Glyphosate will translocate through suckers and injure the tree. I you hit green bark or leaves at any time on apple or peach you will cause injury (see photo 1). Glyphosate should only be used one time a season as a broadcast in apple or peach- that would be in April or early may with a shielded boom and only on trunks with protection.
- **Rely or other generics of (Glufosnate)- Should never be used in apple or peach.** Dr Majek and I did extensive research on Glufosnate on apple and peach in along with 3 other land grant universities. We found it cracked mature brown bark on apple trees. I have documented injury on apple in other orchards so we continue not to recommend it.

See Dr. Majeks comments in the Tree Fruit News of the Rutgers Plant and Pest publication: "Glufosinate Products, Sold as Rely 280, Expand as Generic Products Enter the Market" dated 6/27/2014. Please observe the photographs of peach and apple injury from our replicated trial on mature apple and peach.
https://plant-pest-advisory.rutgers.edu/glufosinate-products-sold-as-rely-280-expand-as-generic-products-enter-the-market/

**For Other Tree Fruit Crop recommends**

For Information on PHI's and other tree fruit crop uses refer to tables 4.4 and 4.5 In the 2021-2022 Rutgers NJ Commercial Tree Fruit Production Guide E002 https://njaes.rutgers.edu/pubs/publication.php?pid=E002

**Sod Middles and Grass Headlands-** Late fall after harvest is the best time to control broad leaf weeds and white clover. Broad leaf weeds host viruses that can be transmitted to trees. In addition dandelion bloom competes with apple bloom. Note that clover blooms all season and makes most insecticides applied to apple off label applications, if white clover blooms are present in the turf on clover.

**2,4-D amine** (Weedar) @ 1.0 quart /Acre or
Embed 3.8SL (2,4-D choline)
+ Copyralid @ 3.0 oz / acre (Spur or Stinger)

# 2021 North Jersey Tree Fruit Report

**Megan Muehlbauer**
***County Agricultural Agent, Rutgers University***
**Win Cowgill**
***Professor Emeritus Rutgers University, Win Enterprises Int., LLC.***
**Dave Schmitt**
***Program Associate, Rutgers University***
**Dean Polk**
***State-Wide IPM Agent, Rutgers University***

***Apple Phenology 2021 Growing Season***

| Location | Silver Tip | Green Tip | ½" Green | Tight Cluster | Pink | First Bloom | Full Bloom | 95% Petal Fall |
|---|---|---|---|---|---|---|---|---|
| Pittstown, NJ (North) | 3/25 | N/A | 4/6 | 4/13 | 4/20 | 4/24 | 4/27 | 5/11 |
| Bridgeton, NJ (South) | N/A | 3/27 | N/A | 4/6 | 4/11 | N/A | 4/20 | 5/7 |

## Apple

### *Weather Conditions*

Monthly temperatures in the state were normal for much of the growing season, with the exception of August which was among the top 5 warmest on record. New Jersey had 5 days of 90F+ in June, 2 days of 90F+ in July and 5 days of 90F+ in August and a sixth day at 89F (see chart on page 2).

Precipitation was normal in the early part of the season. However, double the normal rainfall occurred in Northern NJ from mid-July through mid-September, 24 inches total for the three months, more than the normal 12 inches or 4 inches a month. September found us with 12 inches of rain in Northern New Jersey (see chart on page 2).

### *Horticultural Overview*

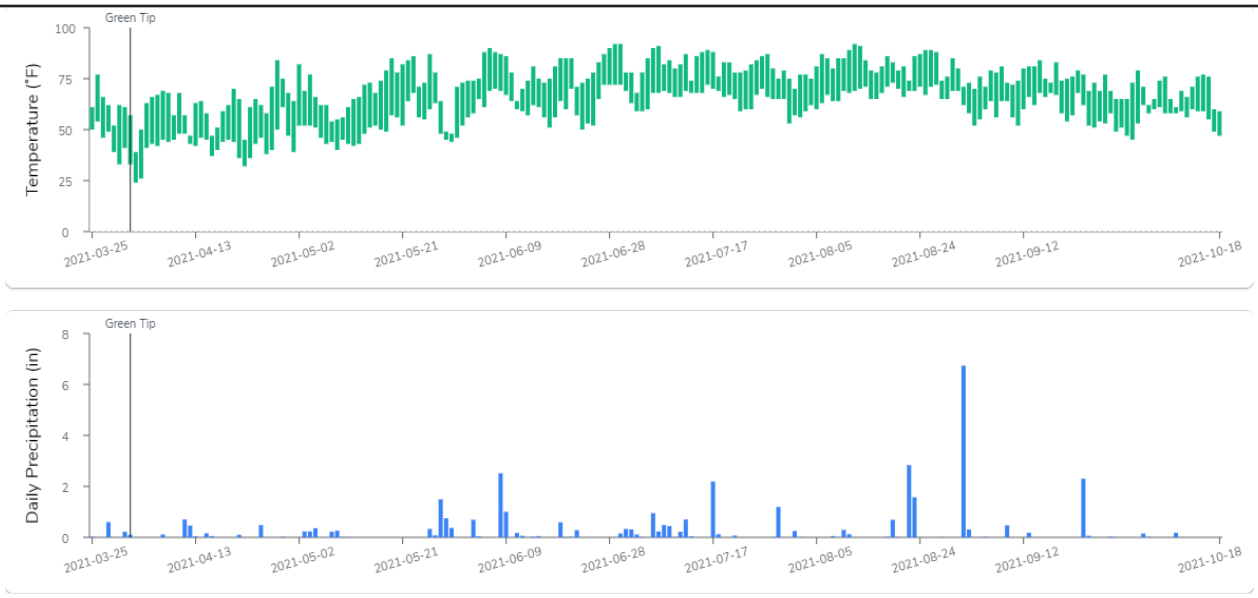
Cropping was above average to excellent on pome fruit and wine grapes. There were virtually no damaging freeze events during bloom. Thus, both crops required significant chemical thinning with PGR's and some hand thinning. There were ample opportunities for multiple applications of thinners beginning at bloom due to ideal spring thinning weather conditions.

Note that growers that have taken advantage of the nibble approach to apple chemical thinning with PGR's have had greater return bloom and more uniform crop load.

As a result of double normal rainfall, we have a very large apple crop both in both fruit size and quantity. Many growers are out of bins and scrambling to find more. Cold storages are already full in some cases.

Note: a key observation for all growers, a wet summer like we just had, shows both the fruit size and total yield potential for orchards.

Growers should take this opportunity to evaluate their capacity to provide adequate irrigation water in dryer seasons to provide irrigation cycles that will provide the




Average max temperature and daily total Precipitation- Pittstown, NJ (Rutgers Snyder Farm).

same fruit size and total crop load that we had this season.

## *Temperature*

A total of 12 days of 90F+ this summer triggered more bitter rot than normal in apples, this was mostly seen in Honeycrisp but many growers had it in on other cultivars. Many growers are spraying sunburn materials on sensitive varieties, more should do so (see Photo # 1 Sunburn). We have had good performance to prevent sunburn with GrowForce Nutriscreen, and we have extensive data on the efficacy of [1]Valent's Raynox Plus (see citation on Raynox).

**Photo 1: Sunburn on Honeycrisp**

Apple harvest was a little early at first, but slowed down to normal by mid-September. Fruit color has been hard to come by with warm temperatures throughout August, September, October.

Many growers let apples hang on the trees beyond normal picking date to try to improve fruit color. Single and double pouches of Retain PGR are being used widely to delay maturity of MacIntosh, Honeycrisp and Gala. This successfully improves fruit color and size and adjusts the picking time window so that they hang on the tree for the PYO in demand season, (Late September through Columbus Day weekend).

## *Pest Management Overview*

**Diseases - season long control with fungicides through September.**

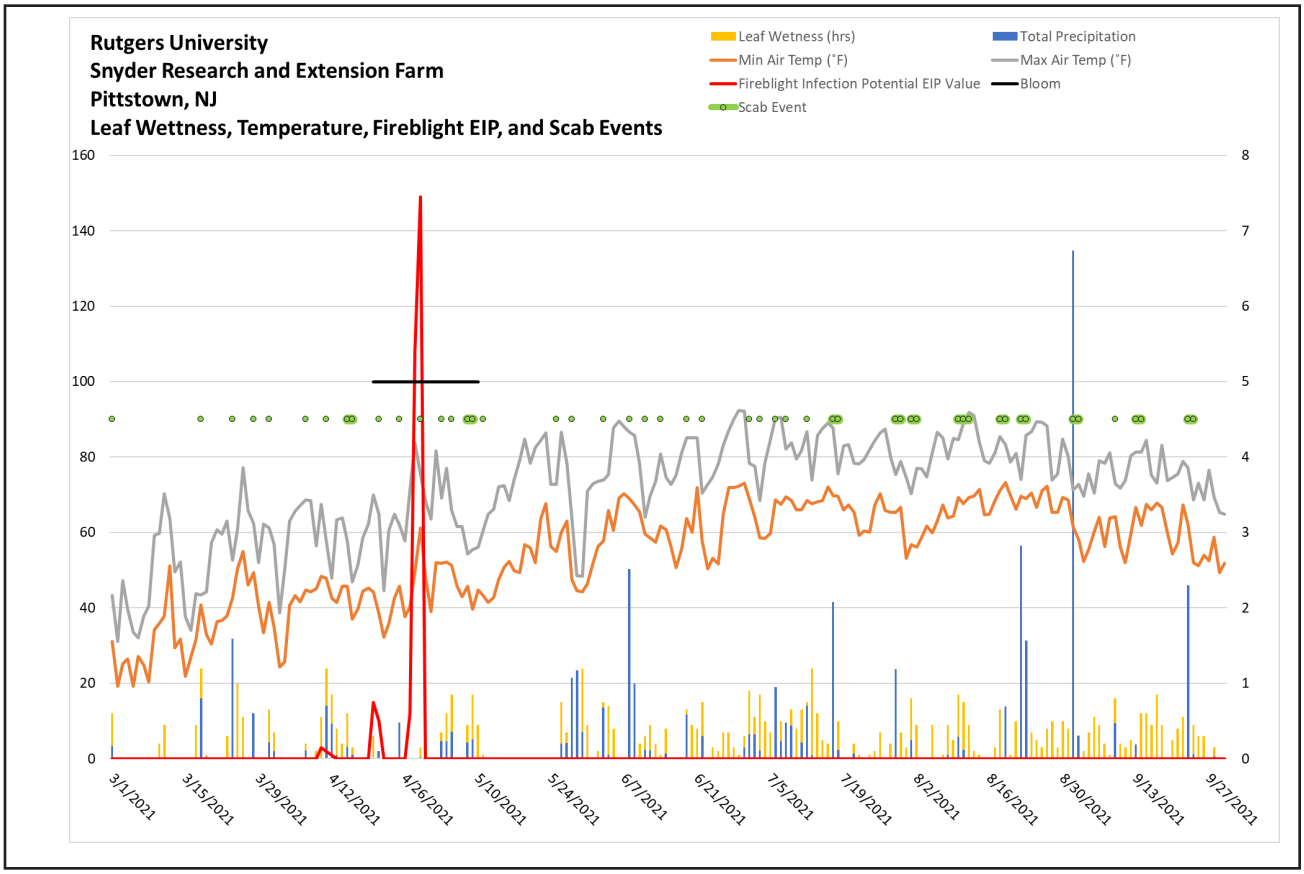
Fireblight remains the number one issue on ***newly planted apple trees and hard cider cultivars.*** Control has not been adequate. More uniform use of copper after planting is needed along with season long disease control as needed.

Apple Scab both primary and secondary remains problematic in some blocks in a number of orchards. More attention to both NEWA and RimPro forecasts are needed to avoid secondary scab.

Fruit rots remain troublesome and increased despite more than adequate control measures. See note above on bitter rot.

**Insect Pests - Bio fixes are fir North Jersey.**

**Oriental Fruit Moth (Biofix April 8) and Codling Moth (Biofix May 1).** CM trap captures were




very low this year compared to recent years. Codling Moth damage in New Jersey was lower than past years, however control measures were needed through August and into September because of above threshold trap captures extending later than normal. A number of north Jersey growers are using Trece mating disruption.

We particularly like the CDMA + OFM combined mating disruption for apples, which provides OFM and Codling Month control. For north Jersey growers where we have 2-3 generations of CM and the second generation can drag on making it hard to time insecticide sprays, especially if we get the 3 generations. We had treatment numbers this year into September where we did not have CM mating disruption.

**Plum Curculio (first scars observed April 29).** Plum Curculio control was more difficult than most years because of prolonged cool spring conditions.

**Ambrosia Beetle/black stem borer** continues to grow in apple blocks in north Jersey. A formal scouting program is needed to follow this pest. Most north Jersey orchards have woods on multiple sides. With the loss of Lorsban, our most effective control, we are in trouble with this pest. Growers need to avoid all stress in new apple plantings and ensure adequate drainage before planting.

Incidence of **San Jose Scale** infestation in tree fruit remained significantly higher than past seasons, throughout the state.

**Spotted Lantern Fly** increased greatly in 2021 with reports coming in statewide.

SLF emerged in 2019 as a major issue in a number of northern vineyards. This activity seems to have slowed down a little this past growing season for the northern half of the state. However, North Jersey growers followed much stricter control sprays. Southern counties experienced the first outbreaks in vineyards and orchards with some observations of adults feeding on apple twigs and excessive levels of honeydew on fruit. The numbers seen per vine in grapes vary greatly from 0-50 . Most of which are being found near the vineyard perimeter close to the wood line. A total of 72% (n=32) of vineyards in a recent survey have seen SLF in their vineyards. Only 50% are spraying for it though. To date little economic damage has been reported despite the large number of sightings.

Threshold numbers are needed for grape and apple

as well as Section 18's for shorter PHI pesticides as we get toward harvest to prevent honeydew on apples.

**Tufted Apple Budmoth (Biofix May 1).** Tufted Apple Budmoth were again observed. Soon after a biofix was set in early May flight increased drastically and was stable over the whole flight period from late May through the first week of July. On some farms weekly pheromone trap captures exceeded one hundred males per trap. Codling Moth treatments successfully controlled TABM, however on farms with CM mating disruption two or three specific TABM treatments were needed.

**Catfacing insects** are an issue in some orchards throughout the state.

**Wooly Apple Aphid** has become an increasing issue in a number of Northern Counties.

**Brown Marmorated Stink Bug** is an issue for in some northern NJ orchards, especially on Honeycrisp. Lack of close to harvest PHI insecticide labels is a major issue.

There is a new material for control of BSMB that has Zero days to harvest, Venerate XC from Marrone BioInovations. North Jersey growers first used it in 2020 on Honeycrisp with good success.

Venerate XC is a biological insecticide that works on many insect pests, BMSB it keeps them from feeding on fruit. Peter Jentsch did extensive testing of this material for BMSB and found it was highly effective to prevent BMSB from feeding on fruit. His work at the full rate showed 100% clean fruit after 24 hours.

**Periodical cicada Brood X of 17-year appeared in high numbers in many North Jersey orchards.** On Tall Spindle Apple trained trees at 1200 trees to the acre it is essential to prevent the shoot flagging that comes from the female ovipositing in the leader and into the short fruiting shoots (photo 2).

The egg laying caused significant damage to several orchards in central New Jersey. North Jersey growers were more aggressive in treatment. A number of farmers reported the need for 5-12 sprays to manage egg laying.

**Photo 2: Cicada Damage to apple shoot.**
Photo Credit: Krawczyk- Penn State

**Our observations** this season were that insecticides must be sprayed every 3-5 days. With no residual impact it is essential to hit the adult females as they are in your trees or on in the air. The best time to spray is when they are active in the morning. As evening approaches, they are less active (especially with cooler temperatures i.e. 50F the last two nights in Baptistown, NJ) We want to kill as many as possible at each application.

The adults are large hard-shelled insects and are difficult to kill, some insecticides knock them down and they are back up in several hours.

If there is a large population in adjacent woods or trees (hedgerows) the females will repopulate apple the next day after application and begin laying eggs again. With some materials, Cavalary (Lambda-cyhalothrin) they seemed to land and shy away for a day, but then back in full force a day later.

**Pesticides for Cicada Control Sources Cornell, Penn State, Virginia Polytech.** Most past work on Cicada has been done by Penn State, Cornell and Virginia Polytech back in 2004. Thank you to Peter Jenstch (Poma Tech Inc.) for all the telephone guidance on controlling this pest this season.

Lanate (methomyl) and the pyrethroid class including Asana (esfenvalarate), Danitol (fenpropathrin) or Warrior (lambda-cyhalothrin), have proven to be quite effective against the cicada, often providing high mortality on contact.

Of these insecticides, it appears that two of the pyrethroids are capable of maintaining low oviposition damage to trees to reduce limb breakage and fruit loss. In studies conducted by Chris Bergh at Virginia Tech in Winchester, VA, three dilute applications were made at 6–8-day intervals to young trees beginning on 28 May. Near the end of the egg-laying season, Asana applied at the high labeled rate of 14.5 oz/A and Danitol applied at 21.0 oz/A provided significantly better ovipositional deterrence to the 17-year cicada.

These same two materials Asana and Danitol were the best in 2004 in work conducted by Peter Jenstch at Cornell.

The best information comes from Cornell University and Pennsylvania State University newsletters, both based on data from the last brood and insect trials in 2004 via Chris Bergh, VPI Biddinger and Hull, Penn State.

### *Citations*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[3] Grzegorz (Greg) Krawczyk, 2021. A Blast from the Past: 17-Year Cicada Control in Pennsylvania Apple Orchards 2021

https://extension.psu.edu/a-blast-from-the-past-17-year-cicada-control-in-pennsylvania-apple-orchards-2021?j=601160&sfmc_sub=54597077&l=159_HTML&u=138%E2%80%A6


**Photo 3**

**Photo 4**

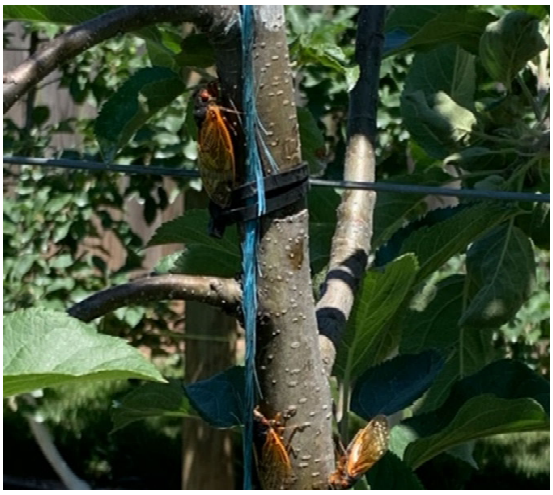
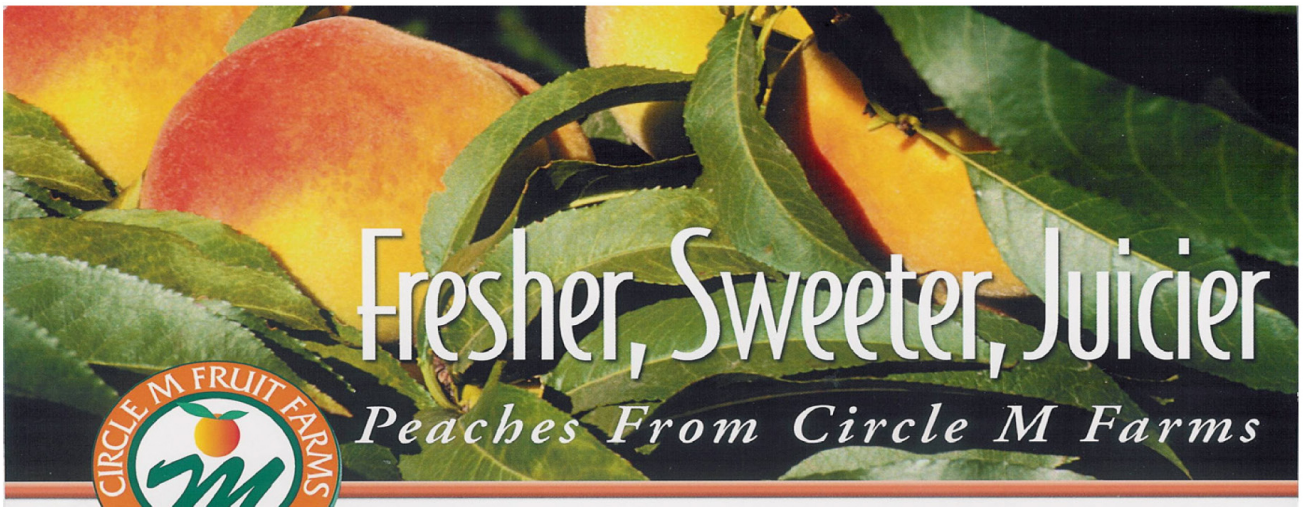


**Photo 5**

**Photo 6**

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# Fruit Notes

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