SCAFFOLDS Fruit Journal, Geneva, NY
Volume 26, No. 4

Update on Pest Management and Crop Development

April 17, 2017

COMING EVENTS

	43°F	50°F
Current DD* accumulations		
(Geneva 1/1-4/17):	224.3	105.5
(Geneva 1/1-4/17/2016):	171.8	68.3
(Geneva "Normal"):	157.0	69.3
(Geneva 1/1-4/24, predicted):	283.9	131.1
(Highland 1/1-4/17):	308.4	152.2

Upcoming Pest Events – Ranges (Normal +/- Std Dev):

	43°F	50°F
Apple grain aphid nymphs present	128-488	63-247
Comstock mealybug 1st gen crawlers in pear buds	215-441	80-254
European red mite egg hatch	231-337	100-168
Green apple aphids present	111-265	38-134
Green fruitworm flight subsides	267-465	124-249
Lesser appleworm 1st catch	276-564	129-305
Obliquebanded leafroller larvae active	158-314	64-160
Oriental fruit moth 1st catch	223-324	96-163

Pear psylla 1st egg hatch	174-328	60-166
Redbanded leafroller 1st flight peak	228-378	104-198
Spotted tentiform leafminer 1st catch	117-215	44-101
Spotted tentiform leafminer 1st oviposition	143-273	58-130
Spotted tentiform leafminer 1st flight peak	268-407	123-214
McIntosh tight cluster	206-258	91-125
McIntosh pink bud	266-316	122-158

*[all DDs Baskerville-Emin, B.E.]

Phenologies

Geneva:	Current	4/24, Predicted
Apple (McIntosh):	1/2-in. green/ early TC	pink
Apple (Empire):	1/2-in. green/ early TC	pink
Apple (Red Delicious):	half-inch green	pink
Apple (Idared):	50% tight cluster	
Pear (Bartlett):	bud burst/ early GC	white bud
Pear (Bosc):	bud burst	white bud
Tart/Sweet Cherry:	bud burst/ early white bud	white bud/ bloom

Peach:	pink	bloom
Plum:	early bud burst/ bud burst	bloom

Highland:

Apple (McIntosh, Empire, Ginger Gold, Spur Red Delicious):	tight cluster
Pear (all):	1/2 white bud

Pest Focus

Highland: Oriental Fruit Moth and Lesser Appleworm 1st trap catch today, 4/17.
Pear Psylla 1st nymphs today, 4/17.

TRAP CATCHES (Number/trap)

Geneva

	4/3	4/10	4/13	4/17
Green Fruitworm	1.0*	1.0	0.5	1.0
Redbanded Leafroller	0.0	0.5*	13.5	24.0
Spotted Tentiform Leafminer	0.0	0.0	0.0	0.0

Highland (Peter Jentsch)

	3/27	4/3	4/10	4/17
Green Fruitworm	0.0	0.0	1.0*	0.0
Redbanded Leafroller	0.0	0.0	10.0*	98.0
Spotted Tentiform Leafminer	0.0	0.0	0.0	0.0

Oriental Fruit Moth	-	-	0.0	2.0*
Lesser Appleworm	0.0	0.0	0.0	5.0*
Obliquebanded Leafroller	-	-	0.0	0.0

* 1st catch

[Section: INSECTS]

WHAT'S IN THE TRUNK?

(Art Agnello, Entomology, Geneva; ama4@cornell.edu)

[Box text: WHAT WOOD BORERS DO?]

[Following is an updated version of our annual pre-season article on trunk boring insects.]

Dogwood Borer

In recent years, there has been increased concern around the Northeast about damage being caused to apple trees by borers. The species of primary concern is dogwood borer, but American plum borer can also be prevalent in western New York apple orchards that are close to tart cherry and peach orchards. From our observations, DWB is very widespread throughout many of the Eastern as well as Western NY orchards with young plantings. While we do not have a complete picture of the effects of these borers on dwarf trees, we do know that they reduce vigor and can, in time, completely girdle and kill trees.

We have tested a number of insecticides against these borers over a number of growing seasons. Lorsban is very effective for this use and we have urged growers to take advantage of it where needed. In the past, we have compared some other materials, including white latex paint and a series of alternative insecticides against Lorsban, with varying results. To make a long story short, none have really provided control comparable to one application of Lorsban. Assail is labeled for this use, but should be considered a fall-back option in the event that using Lorsban is not an acceptable option, and would probably require two applications – one between pink and mid-June, and the second before early August.

Our tests have shown that borers can be controlled season-long by applying Lorsban at one of a variety of times in the spring and summer. While a postbloom trunk application of Lorsban is still allowed, enabling growers to spray at the peak of the dogwood borer flight, applying this material prebloom (as early as half-inch green) works well, too, and may be more convenient. Fall also may be a good time to control dogwood borer. Results from 2002 indicated that Lorsban applied postharvest the previous year (sprays went on in October 2001) controlled both the overwintering and the summer generations of dogwood borer. An October 2002 application of Lorsban similarly provided season-long control of dogwood borer in 2003. Lorsban works when applied in the spring or fall because it infiltrates burrknot tissue and kills larvae concealed within. It is also very persistent in wood, so it continues to work for a considerable time after it is applied (apparently 9-12 months in our trials). Fall application could offer growers a more convenient alternative for applying borer control sprays. Recall that Lorsban label restrictions allow only ONE application of any chlorpyrifos product in apples, whether as a foliar or trunk spray, so these recommendations pertain only if no earlier applications have been made during the season. Bear in mind that we now additionally have a mating disruption option available, Isomate-DWB, which we have found to be very effective in interfering with these insects' pheromone communication process. Use of this product would be recommended as a tactic at mid-May to early June, before the first adult catch of the season.

In a survey we conducted in the mid-1990s, we observed some relationships between borer infestation and various orchard parameters such as the proportion of trees with burrknots, proximity to stone fruit orchards and presence of mouseguards. Conventional wisdom has held that borer problems are worse where mouseguards are in place. Mouseguards can contribute to increased expression of the burrknots that borers invade, and may shield borers from predators and insecticide sprays. This has led some growers to contemplate removing mouseguards under the premise that mice are easier to control than the borers. However, results of our survey indicate that dogwood borer larvae may be found as readily in trees without mouseguards as in those with them. (American plum borer may be a different story in orchards near tart cherry or peach trees.) A number of orchards in which we have conducted borer control trials have never had mouseguards and there is no shortage of dogwood borers in them. If mouseguards are deteriorated and no longer protect the tree, there may be some small advantage, in terms of borer control, to removing them. But, in orchards where mouseguards still provide protection against rodents, removing them for the sake of borer control is probably not worth the risk. Instead, we would recommend the use of trunk sprays to control borers. Even with mouseguards on, insecticides will give adequate control if they are applied carefully (i.e., a coarse, low-pressure, soaking spray with a handgun).

Black Stem Borer

The recent emergence of black stem borer (BSB, *Xylosandrus germanus*) as a cryptic but devastating pest of apple trees in our region has focused more attention on early spring insect activity that could have serious consequences for tree health as the season progresses.

In 2016, we again assessed BSB adult occurrence and distribution in several New York apple growing regions, using ethanol-baited bottle traps hung on metal garden hangers at a 1-m height, placed along the edges of orchards bordered by hedgerows and woods likely to be a source of immigrating beetles. Additional traps were located inside the orchard, adjacent to previously attacked trees, to verify their attractiveness. Traps were checked weekly starting at the end of April, before maximum temperatures of 68°F began to occur, and continuing until the first week of September. Traps were placed on 8 farms in Wayne Co., 16 farms in Orleans and Niagara Counties, 9 farms in the Hudson Valley, and 8 farms in the Champlain Valley. BSB adults were captured at nearly all of the sites, and were most numerous in the western NY locations. First activity was noted in WNY on April 19 (but continuous flight didn't occur until May 15–17), and there were higher counts along the orchard edges than in the interiors. May 31–June 1 was the peak of beetle emergence from the overwintering sites, and 1st generation adults emerged starting at the end of June, with catch continuing into September.

The efficacy and practicality of trunk sprays using chlorpyrifos and three pyrethroid products (lambda-cyhalothrin, permethrin, and fenpropathrin) was evaluated against infestations of ambrosia beetles on two commercial farms having documented infestations (Sodus and Wolcott). All treatments were replicated in randomized complete plots at each of the individual test sites. Potted 2-yr old trees from the nursery were placed in turn into larger pots, which were then flooded to induce stress and promote ethanol production. These potted trees were placed inside wooded areas directly adjacent to the orchard plantings, and the trunks of the potted trees plus the orchard trees were sprayed using a handgun sprayer on May 10, before the start of major BSB flight. The treatments were:

- Lorsban Advanced (chlorpyrifos), 1.5 qt/100 gal
- Cobalt (chlorpyrifos+lambda-cyhalothrin), 1.3 qt/100 gal
- Perm-Up (permethrin), 10 fl oz/100 gal
- Danitol (fenpropathrin), 16 fl oz/100 gal
- Check (unsprayed).

Trees were arranged in circular 5-tree groupings in the wooded areas, which were replicated 10 times at each site. Another identical set of 10 replicate tree groupings was also deployed at each site, with a dispenser of a commercial repellent, BeetleBlock (verbenone) hung ~1 m high on a pole placed in the center of each of the 5-tree groupings. Half of the treated replicates were evaluated for infestations on July 6, after the end of the first adult flight of the season, and the remaining replicates were evaluated near the end of the season, on August 19; these were destructively sampled to document all occurrences of holes, galleries, adults, and brood in the treated trees.

Results on both evaluation dates at Wolcott showed no statistical differences between the insecticide-only or insecticide+verbenone treatments in any of the infestation categories. There was a significant effect of evaluation date for the number of attack sites (higher on 19 Aug) and the number of sites containing empty galleries (higher on 19 Aug) and brood (higher on 6 Jul). At Sodus, results on 6 Jul showed no statistical differences between the insecticide-only or insecticide+verbenone treatments in any of the infestation categories. However, on the 19 Aug evaluation date, the addition of verbenone to either the check or Perm-Up treatments resulted in significantly fewer attack sites containing brood. Also, there was a significant effect of evaluation date for the number of attack sites (higher on 19 Aug), number of sites containing empty galleries (higher on 19 Aug), brood (lower on 19 Aug), and live adults (higher on 19 Aug).

These trials will be repeated again this year, using some topically applied verbenone formulations to get a better idea of whether it can offer any help in BSB contorl. Although recommendations for controlling this pest are still being formulated, it appears that tree health – avoiding stress to the trees – is an important factor in BSB management. Our current advice is for growers to remove and destroy any infested trees detected in a planting, to prevent new infestations in surrounding trees. Trapping and monitoring adults using ethanol lures is a useful and informative tactic, but the fact remains that ambrosia beetles are difficult to control with insecticides. Sprays must be closely timed with beetle attacks, and multiple applications may be necessary. We would advise that growers consider multiple applications against this insect - Lorsban prebloom, and following up in June with one (or two) applications of one of the labeled pyrethroid products, Warrior or Danitol.

We anticipate that growers considering the use of Lorsban trunk sprays against San Jose scale and/or dogwood borer at this time may also see some benefit against ambrosia beetles, particularly in trees that might be under stress from flooding or cold injury.

PREBLOOM LEP MANAGEMENT STRATEGIES IN APPLES

(Peter Jentsch, Entomology, Hudson Valley Research Laboratory; pjj5@cornell.edu)

[Box text: WORM WISE]

After a high of 85 degrees on a very fine Easter Sunday in the Hudson Valley, we came to tight cluster and found our first flight of oriental fruit moth, lesser appleworm, and emergence of the first instar of the pear psylla nymph in our research orchards this morning. We now need to consider management of the early "worm" complex during this period from pink through bloom.

The early worm complex can be found in most commercial apple orchards during the prebloom period, beginning with the emergence of the green fruitworm (GFW). In Highland, we traditionally have our first flight of GFW in early March, yet our first capture of this insect was on the 10th of April this season. A warm start was followed by a mild spring, bringing us to tight cluster in McIntosh. The GFW group comprises at least three different lepidopteran species whose larvae feed on the foliage, flowering parts and developing fruit of pear and apple. An in-depth look at this insect complex can be found in the NYSAES Food & Life Science Bulletin No. 50 by Chapman, P.J., & Lienk, S.E. 1974. This group includes the speckled green fruitworm, *Orthosia hibisci* (Guenee), the widestriped green fruitworm (*Lithophane antennata*), and the humped green fruitworm (*Amphipyra pyramidoides*), among others, that are aptly named after the predominant physical features exhibited by the larvae. Many other leps follow the GFW complex during the prebloom period and include redbanded leafroller, spotted tentiform leafminer, oriental fruit moth, lesser appleworm, codling moth, and emerging larval populations of overwintering obliquebanded leafroller (OBLR).

The GFW and OBLR are of greatest concern to commercial fruit growers prior to and shortly after bloom, with many control measures available for use against these two insects proving to be effective in managing the remaining, more secondary lepidopteran pests.

Scouting & Insect Biology

The GFW complex are members of the noctuid family of Lepidoptera, and as suggested by their family name, the adults fly at night. Flight begins during early apple bud development and peaks at tight cluster, with flight being completed by the pink stage. Pheromone traps should be used to determine adult male presence of all major fruit feeding Leps, followed by scouting to determine presence of larvae in developing fruit clusters and shoot tip terminals.

GFW adults have a wingspread of about 1.5 inches. The forewings are grayish pink; each is marked near the middle with 2 purplish gray spots, outlined by a thin pale border with the hind wings lighter in color than the forewings. Females begin oviposition on twigs and developing leaves when apples are in the half-inch green stage. GFW eggs are about 3/8" in diameter and 3/16" in height; they are white with a grayish tinge, and ridges radiating from the center. The egg takes on a mottled appearance shortly before hatch. A female will deposit only 1 or 2 at any given site, laying several hundred eggs from late March to mid-May in the Hudson Valley.

In the northern regions of the Champlain Valley and throughout the mid-Hudson Valley, the GFW can be a severe pest on early developing apples. The GFW larva passes through 6 instars, the early stages possessing a grayish green body, brown head and thoracic shield. Mature larvae, about 1.5" in length, have a light green body and head. A number of narrow white stripes run along the top of the body with wider, more pronounced white line running along each side. The areas between the stripes are speckled white.

Early stages of larvae feed on foliage and flower buds, and are found inside rolled leaves or clusters. Mature larvae will damage flower clusters during bloom, feeding on developing fruit and foliage 2 weeks after petal fall, with peak populations occurring during bloom. The fruit remaining on the tree will have both shallow and deeply indented corky scars at harvest, often indistinguishable from obliquebanded leafroller injury. Fully grown larvae drop to the ground, burrow into the soil to pupate, and overwinter 2–4 inches into the soil to emerge the following spring as adults.

Management

In years of heavy infestation pressure from GFW, as much as 10% fruit injury can occur. Employing adult pheromone trap captures will provide growers with information on GFW presence and the onset of adult flight. Scouting for larvae to determine levels of pest pressure should begin shortly after tight cluster. Although NY has not developed thresholds for this pest, a provisional threshold of 1 larva or feeding scar per tree has been used to begin applications in Massachusetts. A more conservative threshold should be used in high-value apple varieties on dwarfing rootstocks in high-density planting systems. If GFW populations historically cause economic injury to fruit, management should begin from tight cluster to pink, to target the prebloom Lepidoptera complex.

The GFW complex and OBLR are less susceptible or even resistant to most organophosphates, with the possible exception of chlorpyrifos (Lorsban, IRAC Class 1B). If Lorsban were to be used as a prebloom foliar application, it would also help to control San Jose scale (reduced control of SJS has been observed by Hudson Valley growers). Asana, Ambush/Pounce, Baythroid, Danitol, Warrior, all pyrethroids in IRAC Class 3, tend to have highest efficacy against larvae under cooler temperatures (<72°F). Generally, as the temperature increases, larvae metabolize/detoxify pyrethroid chemistries more effectively, while OPs, carbamates and newer chemistries tend to be more stable and less susceptible to this phenomenon.

The Bt products such as Biobit, Dipel, Javelin, and MVP (IRAC 11 B2) also have a low impact on beneficial mites and are very effective against OBLR and the GFW complex, but relatively ineffective against Codling Moth (CM). The Bt products can be used through bloom as needed, and their use should be optimized by employing multiple applications at 5–7-day intervals at the low labeled rate (1 lb/A of Dipel 10.3 DF, for example). Intrepid (methoxyfenozide) (IRAC 18A) another reduced-risk insecticide, which very effective against the larva, imitates the natural insect molting hormone and works by initiating the molting process. Intrepid is quite safe to birds, fish, and most beneficial insects. Proclaim (emamectin benzoate) (IRAC 6), a second-generation avermectin insecticide related to Agri-Mek, is also an excellent insecticide against the GFW complex, while having a low impact on beneficial mites.

If European red mite (ERM) has emerged, Proclaim, used with a penetrating adjuvant, would reduce early ERM populations. As a reminder, penetrating surfactants in some years can increase uptake of the fungicide captan and cause phytotoxicity to foliage and fruit.

Altacor (chlorantraniliprole) (IRAC Class 28), Delegate (spinetoram) and Entrust (spinosad) (IRAC Class 5), have been used successfully against the surface-feeding and internal Lep complex. However, the placement for these materials has been predominately at the onset of hatch of the summer generation larvae of OBLR, providing excellent results in New York State.

Resistance Management

As we would be managing overwintering OBLR larvae at the same time as we would be controlling GFW, we should consider these applications in light of OBLR management throughout the remainder of the season. Development of insecticide resistance is dependent on the volume and frequency of applications of insecticides and the inherent characteristics of the insect species, so we should limit one insecticide class (**often requiring multiple applications of the same class**) to a single generation of pest for resistance management purposes. The present model for insecticide resistance management (IRM) practices is to use a single insecticide class for a single generation of insect pest. For example, an IRM program against the lep complex, specifically OBLR and CM, would use effective insecticides of three different IRAC classes for each generation, throughout the season.

For Timing examples:

I. Insecticide (Class A) 1 application @ TC-Pink for GFW and overwintering OBLR, or PF for OBLR, RBLR, LAW, OFM larvae

II. Insecticide (Class B) 2-3 applications @ 14d; first emergence of *1st generation* CM and *1st brood* OBLR larvae based on degree-day models.
III. Insecticide (Class C) 1 application @ first emergence of *2nd brood* OBLR larvae and CM as needed, based on degree-day models.

In studies from Michigan in 2008, research on codling moth neonate larvae showed a 7–8x resistance to Imidan (phosmet), 6–10x resistance to Warrior (lambda-cyhalothrin), 14–16x resistance to Intrepid (methoxyfenozide) and 6x resistance to Avaunt (indoxacarb), but no resistance to Assail (acetamiprid) or Spintor (spinosad).

Given the historic failures the apple industry has experienced managing the leafroller and internal worm complex, we should consider designing programs to maintain the effectiveness of these excellent IPM tools beginning early in the season, well before the heat of the battle begins.

This material is based upon work supported by Smith Lever funds from the Cooperative State Research, Education, and Extension Service, U.S. Department of Agriculture. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture.

Scaffolds is published weekly from March to September by Cornell University -- NYS Agricultural Experiment Station (Geneva), and Ithaca -- with the assistance of Cornell Cooperative Extension. New York field reports welcomed. Send submissions by 2 p.m. Monday to:

Scaffolds Fruit Journal
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