SCAFFOLDS Fruit Journal, Geneva, NY
Volume 26, No. 14

Update on Pest Management and Crop Development

June 26, 2017

COMING EVENTS

	43°F	50°F
Current DD* accumulations		
(Geneva 1/1-6/26):	1297.4	728.1
(Geneva 1/1-6/26/2016):	1260.3	769.8
(Geneva "Normal"):	1314.9	817.3
(Geneva 1/1-7/3, predicted):	1484.4	866.1
(Highland 1/1-6/26):	1650.0	1032.0

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

	43°F	50°F
Apple maggot 1st catch	1225-1661	774-1072
American plum borer		
1st flight subsides	1200-1488	745-967
Codling moth 1st flight subsides	1264-1821	801-1200
Comstock mealybug		
1st adult catch	1308-1554	809-1015
Dogwood borer flight peak	1434-1864	898-1233
Lesser appleworm		
2nd flight begins	1429-2108	924-1405
Oriental fruit moth		
2nd flight starts	1257-1496	776-971

Oriental fruit moth		
2nd flight peak	1448-1954	924-1311
Pandemis leafroller		
flight subsides	1441-1692	901-1103
Redbanded leafroller		
2nd flight starts	1209-1562	744-1016
Spotted tentiform leafminer		
2nd flight peak	1385-1786	869-1189

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

MODEL BUILDING

Insect model predictions for Highland[H]/Geneva[G]

[Source: NEWA Apple Insect Models, http://newa.cornell.edu/index.php?page=apple-insects]

Obliquebanded Leafroller larval emergence @ 350 DD43 from biofix; 50% egg hatch @ 630 DD43 (currently @ 671[H] / 380[G]).

TRAP CATCHES (Number/trap)

Geneva

	6/16	6/19	6/23	6/26
Redbanded Leafroller	0.5	0.0	2.5	2.5
Spotted Tent. Leafminer	1.5	50.0*	125.0	107.0
Oriental Fruit Moth	4.0	12.0	19.5	47.5

Codling Moth	36.5	48.0	31.5	9.5
Lesser Peachtree Borer	8.0	18.5	10.5	14.0
Peachtree Borer	15.5	17.5	17.5	15.0
Dogwood Borer	0.5	2.0	5.5	12.0
Obliquebanded Leafroller	32.0	15.0	29.5	16.5

Highland (Peter Jentsch)

	6/5	6/12	6/19	6/26
Redbanded Leafroller	0.0	0.0	2.0	14.5
Spotted Tent. Leafminer	1.0	40.5*	173.5	168.0
Oriental Fruit Moth	3.0	3.5	2.0	2.0
Lesser Appleworm	11.5	11.2	2.5	6.0
Obliquebanded Leafroller	4.5	13.0	20.0	18.5
Codling Moth	13.0	27.0	36.0	29.5
San Jose Scale	1.0	0.0	0.0	0.0
Sparganothis Fruitworm	1.0*	2.0	0.0	1.0
Variegated Leafroller	4.0*	6.0	1.0	2.0
Tufted Apple Bud Moth	3.5*	12.0	13.0	20.0
Dogwood Borer	0.0	0.0	1.0*	1.5

* 1st catch

ORCHARD RADAR DIGEST
[H = Highland; G = Geneva]:

Roundheaded Appletree Borer
RAB peak egglaying period roughly: June 19-July 2 (H)/June 25-July 10.

Dogwood Borer
Peak DWB egg hatch roughly: July 21 (H)/July (G).

Codling Moth
Codling moth development as of June 26:
1st generation adult emergence at 99% (H)/95% (G) and 1st generation egg hatch at 87% (H)/66% (G).

Lesser Appleworm
2nd LAW flight begins around: July 3 (H)/July 12 (G).

Obliquebanded Leafroller
Optimum sample date for late instar summer generation OBLR larvae: June 25 (H)/July 3 (G).

Oriental Fruit Moth
2nd generation first treatment date, if needed: June 28 (H)/July 6 (G).

Redbanded Leafroller
2nd RBLR peak catch and approximate start of egg hatch: July 4 (H)/July 12 (G).

Spotted Tentiform Leafminer
Optimum first sample date for 2nd generation STLM sapfeeding mines is: July 4 (H)/July 13 (G).

[Section: DISEASES]

SBFS & SUMMER ROTS: HIGH RISK OF INFECTIONS IN 2017

(Srdjan Acimovic, Plant Pathology, Highland; sa979@cornell.edu)

[Box text: SUMMER SPOILER ALERT]

Sooty Blotch and Flyspeck (SBFS) are caused by a group of fungi that grow superficially on waxy cuticle of apple fruit. Usually, flyspecks caused by *Zygophiala jamaicensis* show first, and then the sooty blotches, which are caused by a complex of species including *Schizothyrium spp*. These symptoms reduce fruit quality as surface blemishes that reduce market value. In our unsprayed blocks at HVRL, the SBFS symptoms have not become visible yet. Dr. Kari Peter also reports that sooty blotch can shorten fruit storage life, because it allows increased water loss. In most years, we have operated under the assumption that there is reduced risk from this disease between petal fall (PF) and the time until an orchard accumulates 190 hr of wetting (counting from PF onward and using NEWA data for your specific location). Looking at the HVRL's NEWA site, leaf wetting data in May totaled 195 hr, then knowing that we had **a** lingering PF period during the 2.5 first weeks of May, plus getting 108 hr of wetting in June, we surely surpassed 190 hr of wetting, to allow an abundant flow of SBFS spores into apple orchards. The spores are coming from near-orchard vegetation in hedgerows and forest tree lots where the SBFS fungi overwinter on the waxy cuticle of canes, shoots, twigs, fruit and leaves of a large number of inoculum reservoir plant hosts. From there, SBFS spores are spread to pome fruit by wind or wind-borne rain aerosol drops. In the worst cases, such as 2017, which seems to be due to getting so much rain, SBFS infections can start on fruit as early as 2-3 weeks after petal fall. Symptom occurrence after infections are initiated is of course all dependent on environmental factors and can take place for several **weeks to months later.** I think we are up against the former (i.e., harder) scenario in 2017, where moderate temperatures during and after PF, with prolonged leaf wetness periods and high RH, will trigger appearance of symptoms sooner rather than later if fungicide cover sprays were not applied on a schedule tighter than the usual 14-21 days.

2017 so far has been very wet in terms of wetting hours, with many events providing as much as 2" of rainfall. We have probably already passed 190 hr of accumulated wetting from PF at most farms. So, if you reached 190 hr of accumulated leaf wetting since PF on your farm, which I assume most of you did, a SBFS spray program should have already started. After the start of an SBFS program, you should re-spray at 14–21-day intervals, using a 14-day interval if you have accumulated 2 inches of rain since the last spray. The longer interval of 21 days should be used for dryer periods with less than 2 inches of rain. If you reach 2–2.5 inches of rain before the 14-day mark from the last spray, you should re-spray.

In NY and New England, we almost never see sooty blotch until after flyspeck has been visible on fruit for a week or more. If you control flyspeck (FS) well, you will also control sooty blotch. This is because sooty blotch (SB) is controlled by lower amounts of fungicide than flyspeck (D. Rosenberger, personal communication). The one exception, when SB can show up before FS, is if heavy rains late in the summer remove all fungicide residue, and the grower does not re-spray before harvest. This happens if 2.5–3.5 inches of rain fall, usually in a single storm event. In commercial orchards, we have to make sure that there is almost always enough fungicide residue to slow down SB at some point during the 190-hr incubation period for FS (NEWA). If rain reduces fungicide residues, FS will show up first, because it can grow through a bit more fungicide residue than SB.

In the lower Hudson Valley, if by any chance we had a drier spring and early summer (which we did not), the start of your SBFS spray program must not be delayed after July, because you need to spray starting no later than July 10 to prevent summer fruit rot infections. From 10 July, infection pressure from summer rots gets very high.

White Rot – *Botryosphaeria dothidea*

Rotten spots on fruit can usually be seen 2–4 weeks before harvest, even though infections occurred much earlier. The rotten flesh is cylindrical towards the core, but with irregular margins on the fruit surface. When it is warm, the rotten area on the apple surface is tan to light brown, remaining spherical like the shape of fruit, unless mechanically damaged, and is watery and soft to the touch. When it is cooler, rotten areas are firmer and darker tan in color. Fruit can drop or shrivel into dry mummies that are left hanging on the tree. The white rot fungus is endemic in most apple orchards and usually infects fruit during the summer when hot, rainy days occur. The fungus overwinters in many different tree hosts in the landscape, as well as on apple trees in mummified fruit, in cankers on the trunk and branches, in fire blight strikes, and in wood prunings. Apple fruit are susceptible from a few weeks after petal fall until harvest. Branches or trunks can get infected during hot, dry weather in the summer, after freeze injury, on drought-stressed trees, or due to poor nutrition. White rot fungus often inhabits trunks weakened by herbicide injury and/or drought. Cankers on older trunks or limbs are superficial and often cause bark flaking.

For prevention of white rot, good fungicides are: Pristine, Merivon, Topsin M, Flint, Gem, Sovran, Captan, Ferbam granuflo. Topsin, Pristine, Captan, Merivon, and Sovran will also be effective for blossom end rot and bitter rot. Merivon, Flint, Pristine, Topsin and Ferbam are effective for SBFS as well. Mancozeb and DMIs are weak or ineffective on white rot. Sprays are needed from petal fall to harvest, especially during a year like 2017 with a lot of rain. Re-apply these fungicides if 2" or more of rain falls, until harvest.

Black Rot- *Botryosphaeria obtusa*

The most important source of inoculum for black rot is fruitlet mummies left hanging on the tree after last year's thinning. Infections on new leaves are already present in unsprayed orchards from last year, giving you indication that fruit mummies or cankers overwintered somewhere in the canopy. Remove the mummies and cankers if possible. Black rot infects fruit intensively during warm rains from petal fall to harvest. Infections can stay dormant until fruit ripening. Black rot can cause lenticel spot infections during the summer and these can progress in storage. White rot can infect fruit from inoculum present on old drought-stressed trees in cankers on the branches and trunk.

For preventing black and white rots, good choices are: Pristine, Merivon, Topsin M, Flint, Gem, Sovran, Captan, Ferbam granuflo. Topsin, Pristine, Captan, Merivon, and Sovran will also be effective for blossom end rot and bitter rot. Merivon, Flint, Pristine, Topsin and Ferbam are effective for SBFS as well.

Bitter Rot – *Colletotrichum* species

Bitter rot areas are round and pale brown, with a flat depression. During wetting, orange spore masses form on the rot surface from the center, in concentric rings. Spores are dispersed by insects and splashing rain. When dry, the spore masses turn into black spots, and with re-wetting they turn orange again. When fruit is cut to the core, the rot has a V-shaped flesh area of decay towards the core. Bitter rot develops in the field in late summer after infections that take place during warm wetting periods. This rot can spread fast if fruit are not protected with fungicides. In different locations of the world, different *Colletotrichum* species cause bitter rot. In Norway, it is reported that *Colletotrichum* fungi usually overwinter in apple buds. In the US, research indicates that *Colletotrichum* species overwinter in dead branches in the tree canopy, such as from fire blight, or in infected mummified fruit left on the orchard ground. Infected fruit left to overwinter in the so-called "biological desert" of a grass-free herbicide strip, are most conducive for fungal survival over many years, since their natural decomposition is very slow (refer to Rosenberger & Cox's 29 Aug 2016 Scaffolds article). Cornell pathologists report that: (1) more frequent days during the summer with warm wetting are essential for establishing bitter rot infections, (2) new cultivars introduced in the last 25 years are susceptible to bitter rot, (3) cover spray intervals stretched to more than 21 days allow infections to occur, and (4) late maturing cultivars do not get needed additional fungicide sprays during September and/or early October for full protection from bitter rot.

For management, remove overwintering sources of inoculum; i.e., dead wood and mummified fruit on the tree or the orchard floor. This will help increase efficacy of applied fungicides: Captan is effective if sprayed at the full label rate (mid-label rates may fail to control bitter rot in high-inoculum orchards or when weather conditions are favorable for infection). QoI fungicides such as Flint, Sovran, and the pyraclostrobin in Pristine and Merivon are good choices. Always combine QoIs with at least mid-label rates of Captan. Ziram at the high rate is also effective. Topsin M and the DMIs are not very effective for bitter rot under high disease pressure (Rosenberger and Cox 2016a). Re-apply these fungicides if 2" or more of rain falls, until harvest.

[Subscribe free to Acimovic Lab blogs: http://blogs.cornell.edu/acimoviclab/]

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LIGHTNING INJURY IN APPLE TREES

(Dave Rosenberger, Plant Pathology, Highland, NY; dar22@cornell.edu)

[Box text: MORE HEAT THAN LIGHT]

Lightning damage in apple orchards is not especially common, but when it occurs it often causes great consternation, because trees that were completely healthy one day will have browned leaves and dead bark just a day or two later. I've been called to diagnose tree deaths caused by lightning only about six or eight times over the past 35 years. In all of those cases, growers were concerned that whatever killed the tree in question might spread to the rest of the orchard. That concern carries special urgency if fire blight has already been detected in the area. The good news about trees killed by lightning is that this kind of "fire blight," although deadly, is not contagious.

Lightning strikes on large forest or shade trees will sometimes knock the bark off of one side of the tree where the electrical charge heats the sap to beyond the boiling point (see https://extension.umd.edu/hgic/lightning-damage-trees-and-shrubs). During my career, I have seen this kind of injury on only one apple tree, and that was many years ago in a very large old tree that had been injured many years before my visit. Usually, lightning damage in apples creates more subtle injuries, but lightning damage is relatively easy to diagnose if one knows what to look for.

When just one or two trees in large plantings die suddenly during summer, I usually suspect lightning injury. If trees are supported by wires, then all trees between two support posts may be injured or killed. To verify lightning as the cause of tree death or injury, one can look for additional evidence to support the lightning injury hypothesis. First, did thunderstorms occur in the area anytime in the past several weeks? If so, then the next steps involve looking for some of the following telltale signs of lightning injury:

1. Brown-black leaves are still attached, because a branch or tree killed by lightning has no time to form an abscission layer.

2. The killed leaves may have sharply bent petioles, presumably because the rapid desiccation caused by the heating deforms the normal arc of the leaf petiole.

3. Tangential cuts through recently killed terminal shoots may show "pelletized" pith in the center of the shoots because the pith contains more water than other shoot tissue, and therefore shrinks into distinct segments or "pellets" when it is desiccated by the electrical charge.

4. On trees that are not attached to a trellis, one or two trees at the center of the strike may be completely killed, but the tallest twigs or limbs on adjacent trees may show dieback caused by parallel charges that are of lower intensity than the main charge. The lesser charges kill shoot tips in adjacent trees, but dissipate to sub-lethal levels as they move into heavier wood, thereby killing only the smaller and most exposed shoots on adjacent trees.

5. In southeastern New York, trunks of apple trees killed by lightning are sometimes covered by fungal bracts (shelf fungi) within several weeks after the lightning strike occurred. These bract fungi can sporulate very quickly on the killed trees, because they were already present in the discolored xylem that is often evident in cross-sections of older trees. The tree's natural defenses limit the growth of these xylem-invading fungi, and they can only sporulate (form bracts on the tree surface) when they are able to progress outward all the way to the bark surface. When lightning kills a tree, the killed wood and the water it contains provide the perfect growing conditions for these fungi, so they rapid colonize the wood killed by lightning and produce bracts.

In some cases, trees may be injured but not killed by lightning, or just a few twigs or branches may be killed and the damage may not be noticed immediately. When such damage is noted several weeks after the lightning injury occurred, tangential cuts made through small branches just below the killed area often reveal ovals of dead tissue killed by the lightning, but overlaid by new xylem that was produced after the injury.

Trees damaged by lightning may attempt to recover, but sometimes exhibit reduced growth and other decline symptoms. In one case, lightning damage killed sections of bark that appeared as cankers later in the season, whereas other intervening sections on the same limbs still had live bark. After removing the bark from affected limbs, the darkened "cankers" where the cambium was killed by lightning contrasted sharply with the healthy white xylem where the cambium had survived and produced new tissue. Cross-sections through areas of apparently healthy bark on the affected limbs revealed a ring of brown tissue beneath the bark, evidence of injury by the electrical charge from lightning. The bark on one side of the trunk near the base of the tree had been killed by the lightning, but new xylem was being produced in interesting patterns on the other side of the tree where the tree was attempting to recover from the underlying damage. Trees with damage as severe as this are likely to be permanently disabled and in most cases will need to be removed.

Additional photos of lightning damage are posted on my blog at http://blogs.cornell.edu/plantpathhvl/apple-diseases/lightning-damage/ .

The ability to recognize lightning damage is useful because a correct diagnosis can allay fears that some unique disease or insect problem is about to destroy the orchard. Apple growers deal with many such threats, but lightning damage rarely causes extensive losses in orchards.

[Section: INSECTS]

LARVA NON GRATA
(Art Agnello, Entomology, Geneva; ama4@cornell.edu)
[Box Text: TRAPPLE APPLE]

We are again at the time of year to expect the first appearance of apple maggot (AM) flies in wild apple trees and abandoned orchards, which begins first in eastern N.Y.; western N.Y. could be about a week later, depending on what kind of temperatures and rainfall we get over the next week or two. Crop scouts and consultants have used traps to monitor AM populations for many years, but this approach, useful as it is, nevertheless is not recommended in all cases. Some orchards have such high or such low AM populations that monitoring for them is not always time-efficient. That is, in some blocks, sprays are necessary every season, often on a calendar basis; however, in some blocks the populations are so low that they are rarely needed at all. However, most commercial N.Y. orchards have moderate or variable pressure from this pest, so monitoring to determine when damaging numbers of them are present allows growers to apply only the number of sprays necessary to protect the fruit from infestation.

Sticky yellow panels were some of the first trpas for AM, and have been in use for over 50 years; these can be very helpful in determining when AM flies are present. The insects emerge from their hibernation sites in the soil from mid-June to early July in New York, and spend the first 7–10 days of their adult life feeding on substances such as aphid honeydew until they are sexually mature. Because honeydew is most likely to be found on foliage, and because the flies see the yellow panel as a "super leaf", they are naturally attracted to it during this early adult stage. A few of these panels hung in such an orchard can serve as an early warning device for growers if there is a likely AM emergence site nearby.

Many flies pass this period outside of the orchard, however, and then begin searching for fruit only when they are ready to mate and lay eggs. That means that growers don't always have the advantage of this advance warning, in which case the catch of a single (sexually mature) fly indicates that a spray is necessary immediately to adequately protect the fruit. This can translate into an undesirable risk if the traps are not being checked daily and are used to signal an immediate response, something that's not always possible during a busy summer.

To regain this time advantage, more effective traps have been developed, which are in the form of a "super apple" — large, round, deep red, and often accompanied by the scent of a ripe apple — in an attempt to catch that first AM fly in the orchard. Because this kind of trap is so much more efficient at detecting AM flies when they are still at relatively low levels in the orchard, the traps can usually be checked twice a week to allow a 1–2-day response period (before spraying) after a catch is recorded, without incurring any risk to the fruit. Research done in Geneva over a number of years indicates that some of these traps work so well that it is possible to use a higher threshold than the old "1 fly and spray" guidelines recommended for the panel traps. Specifically, it has been found that sphere-type traps baited with a lure that emits apple volatiles attract AM flies so efficiently that an insecticide cover spray is not required until a threshold of 5 flies per trap is reached.

The recommended practice is to hang three volatile-baited sphere traps in a 10- to 15-acre orchard, on the outside row facing the most probable direction of AM migration (towards woods or abandoned apple trees, or else on the south-facing side). Then, the traps are periodically checked to get a total number of flies caught; dividing this by 3 gives the average catch per trap, and a spray is advised when the result is 5 or more. Be sure you know how to distinguish AM flies from others that will be collected by the inviting-looking sphere. There are good photos for identifying the adults on the Apple Maggot IPM Fact Sheet; check the web version at: http://hdl.handle.net/1813/43071

In home apple plantings, it is theoretically possible to use these traps to "trap out" local populations of AM flies by attracting any adult female in the tree's vicinity to the sticky surface of the red sphere before it can lay eggs in the fruit. Research done in Massachusetts suggests that this strategy can protect the fruit moderately well if one trap is used for every 100–150 apples normally produced by the tree (i.e., a maximum of three to four traps per tree in most cases), a density that makes this strategy fairly impractical on the commercial level.

A variety of traps and lures are currently available from commercial suppliers; among them: permanent sphere traps made of wood or stiff plastic, disposable sphere traps made of flexible plastic, and sphere-plus-panel ("Ladd") traps. The disposable traps are cheaper than the others, of course, but only last one season. Ladd traps are very effective at catching flies, but are harder to keep clean, and performed no better than any other sphere trap in our field tests. Brush-on stickum is available to facilitate trap setup in the orchard. Apple volatile lures are available for use in combination with any of these traps. These tools are available from a number of orchard pest monitoring suppliers, among them:

- Gempler's Inc., 100 Countryside Dr., PO Box 328, Belleville, WI 53508; 1-800-382-8473, Fax, 1-800-551-1128 <http://www.gemplers.com/product/R16102/Disposable-Red-Sphere-Traps-Olson-Box-of-100>
- Great Lakes IPM, 10220 Church Rd. NE, Vestaburg, MI 48891; 800-235-0285, Fax 989-268-5311 <http://www.greatlakesipm.com/balltraps.html - redball>

• Ladd Research Industries Inc., 83 Holly Court, Williston, VT 05495; 800-451-3406, Fax 802-660-8859 <http://www.laddresearch.com/apple-maggot-fly-trap-kit>

By preparing now for the apple maggot season, you can simplify the decisions required to get your apples through the summer in good shape for harvest.

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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
Editor: A. Agnello
Dept. of Entomology, NYSAES

630 W. North St.
Geneva, NY 14456-1371
Phone: 315-787-2341   FAX: 315-787-2326
E-mail: ama4@cornell.edu
Online at
<**http://www.scaffolds.entomology.cornell.edu/index.html**>