scaffolds
Update on Pest Management and Crop Development
FRUIT JOURNAL
June 30, 2014 VOLUME 23, No. 15 Geneva, NY



FLY BOYS

ORCHARD RADAR DIGEST

[H = Highland; G = Geneva]:

**Roundheaded Appletree Borer**
Peak RAB egglaying period roughly: June 23 to July 5 (H)/June 27 to July 10 (G). RAB peak hatch roughly: July 8 to July 25 (H)/July 12 to July 30 (G).

**Dogwood Borer**
Peak DWB hatch roughly: July 26 (H)/July 31 (G).

**Codling Moth**
Codling moth development as of June 30: 1st generation adult emergence at 99% (H)/98% (G) and 1st generation egg hatch at 89% (H)/80% (G).

**Lesser Appleworm**
2nd generation LAW flight begins around: July 7 (H)/July 11 (G).

Obliquebanded Leafroller
Optimum sample date for late instar summer generation OBLR larvae: June 30 (H)/July 4 (G).

**Oriental Fruit Moth**
2nd generation OFM flight begins around: June 26 (H)/June 30 (G).
2nd generation first treatment date, if needed: July 3 (H)/July 7 (G).

**Redbanded Leafroller**
2nd RBLR flight begins around: June 27 (H)/July 1 (G).

**Spotted Tentiform Leafminer**
Rough guess of when 2nd generation sap-feeding mines begin showing: July 2 (H)/July 6 (G).

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IN THIS ISSUE...

# GIFT OF THE MAGGI?

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

❖❖ It is once again the time of year when we expect the first appearance of apple maggot (AM) flies in wild apple trees and abandoned orchards, beginning 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 so. Crop scouts and consultants have used traps to monitor AM populations for a long time, 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 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 have been in use for over 50 years, and these can be very helpful in determining when AM flies are present. These 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, traps have been developed 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

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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 pm Monday to:

scaffolds FRUIT JOURNAL
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This newsletter available online at:
http://www.scaffolds.entomology.cornell.edu/index.html

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 (No. 102GFSTF-I8); check the web version at: http://www.nysipm.cornell.edu/factsheets/treefruit/pests/am/am.asp.

In home apple plantings, these traps can be used 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/ball-traps.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. ❖❖

DISEASES

## DON'T BE BITTER

### SUMMER FUNGICIDES FOR APPLES WHERE BITTER ROT IS AN ISSUE

(Dave Rosenberger, Plant Pathology, Highland)

❖❖ Last week's issue of Scaffolds contained an article about models for predicting when sprays for sooty blotch and flyspeck (SBFS) need to be initiated during summer. That article also contained brief comments on fungicide options. I have one correction and one addition to that article. First, I stated last week that the original SBFS model that was developed in North Carolina used 272 hours of accumulated wetting as the incubation period for SBFS, whereas the correct number is 273 hours. (I should have looked up the number rather relying on my memory.) Second, I should have included a link in last week's article to an excellent summary of SBFS models

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that was published by Dan Cooley and Jon Clements in Fruit Notes way back in 2009 (see http://umassfruitnotes.com/v74/a6.pdf). The remainder of this article focuses on additional factors to consider when the summer fungicide program must protect not only against SBFS, but also against bitter rot.

Bitter rot is a summer fruit decay caused by *Colletotrichum* species. It is a very serious problem in regions that have hot humid summers, whereas it occurs only sporadically in northern New York and northern New England. The first bitter rot lesions usually show up on the sun-exposed sides of fruit, where they appear as tan spots that are slightly sunken compared with surrounding tissue (Fig. 1). Cutting fruit in half through the center of a bitter rot lesion will reveal a distinctly V-shaped area of decay extending toward the seed cavity (Fig. 2), something that is not typical of other fruit decay pathogens. In damp weather, the surface of bitter rot lesions may be covered with an orange ooze (Fig. 3) that contains millions of conidia waiting to be splash-dispersed to new infection sites. The orange ooze appears black in dry weather. Although primary infections are primarily on the sunny side of sun-exposed fruit, secondary spread may result in infections throughout the tree, including on shaded fruit inside the tree canopy.


Fig. 1. Honeycrisp with small lesions and advanced decay


Fig. 2. V-shaped decay typcial of bitter rot


Fig. 3. Orange sporulation on bitter rot lesion

Controlling bitter rot is complicated by at least three different factors. First, some fungicides that control SBFS have little or no activity against bitter rot. Fungicides used for SBFS that do not control bitter rot include Topsin M, Inspire Super, and the phosphite fungicides. Second, for those fungicides that can be effective against bitter rot (i.e., captan, ziram, strobilurins), low rates that are sufficient for controlling SBFS may be totally inadequate against bitter rot. Thus, although Topsin M at 1 lb/A plus Captan-80 at 2 lb/A will generally provide good control of SBFS, black rot, and white rot in the Hudson Valley, that combination may provide only marginal activity against bitter rot because Topsin M is ineffective and Captan-80 must be applied at 4 to 5 lb/A on a 14-day interval to control bitter rot when inoculum is present and weather favors spread of this disease.

The third factor that complicates bitter rot control, in my opinion, is that heat stress may inactivate some of the natural defenses in healthy apple fruit and leaves the affected fruit highly susceptible to invasion by *Colletotrichum*. The relationship between heat stress and susceptibility to bitter rot has not been proven, so the scenario presented below is conjecture based on my own field observations over the past 10–15 years. During that time, I have repeatedly noted that bitter rot often begins to appear in the Hudson Valley after we have ex-

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perienced several days of sunny weather with high humidity and with maximum temperatures in the mid to upper 90's (i.e., typical "dog days" of summer). Usually, within 10–14 days of that weather scenario, I begin hearing reports of bitter rot appearing in Honeycrisp apples, and sometimes in other cultivars as well. Most of that initial bitter rot is on the sun-exposed surfaces of fruit. Fruit may also develop black rot lesions at the same time, and a few fruit may show distinctive symptoms of heat stress, wherein the "cooked" flesh collapses and ridges often appear on the fruit surface (Fig. 4).


Fig. 4. Heat injury on Empire

The proportion of fruit affected by bitter rot following heat stress appears to be at least somewhat correlated with water stress at the time that we experienced the high temperatures. Decay incidence is usually especially high in trees that were water-stressed when the heat wave occurred. In fact, we found that the very best fungicide programs that I could design failed to control bitter rot in water-stressed trees in a 2011 trial at the Hudson Valley Lab wherein the best treatments still had 25 to 35% of Honeycrisp fruit with bitter rot at harvest (Rosenberger et al., 2012).

Following are my hypotheses to explain why heat and water stresses may contribute to bitter rot problems. First, trees with adequate soil moisture will continue to respire normally for a longer period as temperatures rise than will trees under drought stress. In the water-stressed trees, stomata will close sooner to conserve water. At that point, cooling from evapotranspiration ceases and fruit exposed to sunlight overheats. Work on the west coast has shown that temperatures just below the skin on sun-exposed fruit can be as much as 25°F higher than air temperatures. That means that, on a day when temperatures reach 100°F, internal fruit temperatures may exceed 125°F, especially if trees are already drought-stressed. Cells begin to die when temperatures approach 130°F. Fruit with cells that were killed directly by the heat develop sunburn and/or uneven growth (Fig. 4). However, I suspect that many fruit that never show sunburn or heat injury may still have been heated enough to inactivate natural defense systems that would otherwise help the trees resist infection by Colletotrichum and other fruit rot fungi. Those fruit with a compromised defense system are so susceptible to decay that even a good fungicide program cannot protect them.

Until someone can investigate these hypotheses in controlled trials, we are left with a degree of uncertainty about how to control bitter rot on susceptible cultivars such as Honeycrisp. Nevertheless, I suggest the following approaches:

1. Observational evidence suggests that bitter rot can overwinter on infected fruit on the orchard floor, including fruit that are hand-thinned and then exposed to inoculum left from last year's crop. Thus, removing decayed fruit after harvest can be a critical component for controlling bitter rot in blocks that seem to have a perennial problem. Inoculum can also come from a wide variety of wild hosts, so allowing more space between apples and woodlots/hedgerows on the orchard perimeter may be helpful if other control measures prove ineffective. Increasing the space between wild hosts and the orchard can sometimes be accomplished by pushing back woodlots, whereas in other cases the first row of apple trees may need to be removed.
2. During summer, monitor the long-term weather forecasts with an eye for spotting predicted heatwaves (90-plus-degree weather) at least 3 to 5 days before the heat arrives so that trickle irrigation can be activated to ensure that soil moisture is near sat-

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uration levels when the heat wave arrives.

3. Before the heat arrives, apply a fungicide cover consisting of a strobilurin fungicide (e.g., Flint, Pristine, Merivon) in combination with captan at 4 to 5 lb/A. Applying the fungicide protection after the heat wave but before any rain occurs may work equally well.

4. I don't know if the various commercial products that are promoted for sunburn control will also help to prevent over-heating of fruit, thereby helping with bitter rot control. They may be worth trying, especially if they can be applied along with fungicides just ahead of predicted heat waves.

In conclusion, we really need more field research on strategies for controlling bitter rot in northeastern United States. Until someone tackles this research problem, I can only suggest an integrated approach that combines sanitation (removing rotted fruit from beneath trees in the fall and/or removing wild hosts from orchard perimeters), sustaining host defenses with irrigation ahead of hot weather (and perhaps application of sun-blocker materials), and applications of appropriate fungicides at doses needed for activity against bitter rot. In the meantime, those who never see bitter rot can be thankful that they only need to contend with SBFS, black rot, and white rot. ❖❖

Literature cited:

Rosenberger, D.A., Meyer, F.W, Rugh, A.L. and Sudol, L.R. 2012. Controlling apple summer diseases with IKF-5411, Luna Sensation, Merivon, and Pristine, 2011. Plant Disease Management Reports 6:PF025. Online publication. DOI:10.1094/

GENERAL INFO

FRUIT TOUR

EVENT ANNOUNCEMENTS

CCE-LOF SUMMER TOUR - JULY 24

❖❖ The 2014 Lake Ontario CCE Summer Fruit Tour will take place on July 24, and will feature New Technology in the Orleans/Niagara Co. Fruit Industry. The stops and topics include:

- Kast Farms, Lattin Rd., Albion - Gala, NY1, & NY2 plantings, economics, and management, including de-fruiting techniques; weed control in young trees; managing fire blight in young trees (Deb Breth, Alison DeMarree, Kerik Cox, Terence Robinson, Mario Miranda Sazo).
- Pettit Farms, Bates Rd., Medina - Black stem borer invasions; low vigor in NY1 & Honeycrisp (Deb Breth, Hannah Rae Warren, Art Agnello, Terence Robinson).
- Ledge Rock Farms, Gravel Rd., Medina - NY1 & NY2 tall spindle plantings; precision chemical thinning (Terence Robinson, Mario Miranda Sazo).
- Vizcarra Vineyards At Becker Farms, Quaker Rd., Gasport - history of farm & market, winery and brewery (Oscar & Mindy Vizcarra).
- New Royal Orchards, Rt. 31, Gasport - new SDHI fungicides for scab and mildew; phytotoxicity demo with tank mixes; protecting sweet cherries from rain with Voen and other canopies (Kerik Cox, Deb Breth, Mario Miranda Sazo, Terence Robinson, and Greg Lang - Michigan State).

There is no charge to attend, thanks to Sponsor and Donor support, but please pre-register by July 18 (585-798-4265 x26; or krh5@cornell.edu; or on LOF website: http://lof.cce.cornell.edu/
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## PEST FOCUS

Geneva: **Oriental fruit moth** 2nd flight began 6/26. **Apple maggot** 1st catch 6/27. **Redbanded leafroller** 2nd flight began today, 6/30.

Highland:
**Obliquebanded leafroller** eggs at peak of hatch. **Oriental fruit moth** 2nd flight beginning.

## INSECT TRAP CATCHES
### (Number/Trap/Day)

**Geneva, NY**

| | 6/23 | 6/26 | 6/30 |
|---|---|---|---|
| Redbanded leafroller | 0.0 | 0.5 | 0.5* |
| Spotted tentiform leafminer | 15.0 | 14.0 | 27.0 |
| Oriental fruit moth | 0.1 | 2.2* | 3.3 |
| Codling moth | 0.3 | 0.2 | 0.5 |
| Lesser appleworm | 1.0 | 1.3 | 0.9 |
| San Jose scale | 0.3 | 0.0 | 0.0 |
| American plum borer | 0.0 | 0.0 | 0.1 |
| Lesser peachtree borer | 0.0 | 0.0 | 0.6 |
| Pandemis leafroller | 0.9 | 7.7 | 2.6 |
| Obliquebanded leafroller | 0.8 | 0.8 | 3.0 |
| Dogwood borer | 0.1 | 4.8 | 5.4 |
| Peachtree borer | 0.1* | 0.5 | 0.9 |
| Apple maggot | – | 0.0 | 0.3* |

* first catch

**Highland, NY**

| | 6/23 | 6/30 |
|---|---|---|
| Redbanded leafroller | 0.6 | 5.4 |
| Spotted tentiform leafminer | 53.0 | 50.2 |
| Oriental fruit moth | 2.5 | 2.7 |
| Codling moth | 3.2 | 1.6 |
| Lesser appleworm | 1.3 | 1.4 |
| Variegated leafroller | 1.2 | 0.6 |
| Tufted apple budmoth | 4.7 | 3.7 |
| Sparganothis fruitworm | 0.1 | 0.0 |
| Obliquebanded leafroller | 5.9 | 4.5 |

## UPCOMING PEST EVENTS

| | 43°F | 50°F |
|---|---|---|
| Current DD accumulations (Geneva 1/1–6/30/14): | 1369 | 884 |
| (Geneva 1/1–6/30/2013): | 1364 | 881 |
| (Geneva "Normal"): | 1430 | 859 |
| (Geneva 1/1–7/7/14, predicted): | 1581 | 1047 |
| (Highland 1/1–6/30/2014): | 1592 | 1029 |

| Coming Events: | Ranges (Normal ±StDev): | |
|---|---|---|
| Codling moth 1st flight subsides | 1249–1839 | 789–1213 |
| San Jose scale 1st flight subsides | 855–1227 | 508–760 |
| Pandemis leafroller flight subsides | 1426–1660 | 891–1073 |
| Obliquebanded leafroller summer larvae hatch | 1038–1460 | 625–957 |
| Cherry fruit fly 1st catch | 755–1289 | 424–806 |
| Lesser appleworm 1st flight subsides | 990–1466 | 604–932 |
| Pear psylla 2nd brood eggs hatch | 967–1185 | 584–750 |
| Comstock mealybug 1st adult catch | 1308–1554 | 809–1015 |
| Spotted tentiform leafminer 2nd flight peak | 1384–1800 | 866–1200 |


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.