Scaffolds

Update on Pest Management and Crop Development

FRUIT JOURNAL

July 15, 2002 VOLUME 11, No. 18 Geneva, NY

ORCHARD RADAR DIGEST

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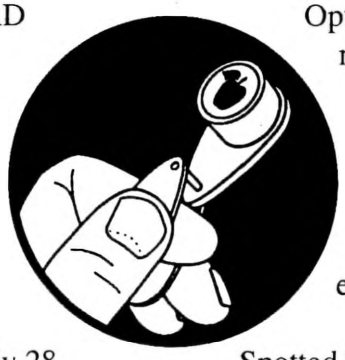

Geneva Predictions:

Roundheaded Appletree Borer
Peak hatch roughly: July 12 to July 28

Dogwood Borer
First DWB egg hatch roughly: June 29. Peak hatch roughly: July 31

Codling Moth
CM development as of July 15: 2nd generation adult emergence at 2% and 1st generation egg hatch at 99%. Key management dates: 2nd generation 3% CM egg hatch: July 31 (= first spray date where two sprays needed to control 2nd generation codling moth, 2nd spray is 2–3 weeks later)

Lesser Appleworm
2nd LAW flight, first trap catch: July 08

Obliquebanded Leafroller
1st generation OBLR flight, first trap catch: June 11.
Optimum first sample date for summer generation OBLR larvae: July 02,
If first OBLR larvae sample below threshold, date for confirmation follow-up sample: July 05

Oriental Fruit Moth
2nd generation OFM flight, first trap catch: July 01
Optimum 2nd generation - first treatment date, if needed: July 08
Optimum 2nd generation - second treatment date, if needed: July 17

Redbanded Leafroller
2nd RBLR flight, first trap catch: July 02
Peak catch and approximate start of egg hatch: July 13

Spotted Tentiform Leafminer
Rough guess of when 2nd generation sap-feeding mines begin showing: July 11
Optimum first sample date for 2nd generation STLM sapfeeding mines:
July 17 (late enough that sap-feeding mines for much of population are visible, but early enough that transition to less vulnerable tissue-feeding stage is just beginning). Second optimized sample date for 2nd generation STLM sapfeeding mines, if needed: July 24

continued...

IN THIS ISSUE...

Highland Predictions:

Roundheaded Appletree Borer
Peak hatch roughly: July 09 to July 24.

Dogwood Borer
First DWB egg hatch roughly: June 23. Peak hatch roughly: July 26

Codling Moth
CM development as of July 15: 2nd generation adult emergence at 11% and 2nd generation egg hatch at 1%. Key management dates: 2nd generation 3% CM egg hatch: July 24 (= first spray date where two sprays needed to control 2nd generation codling moth, 2nd spray is 2–3 weeks later)

Lesser Appleworm
2nd LAW flight, first trap catch: July 03.

Oriental Fruit Moth
2nd generation OFM flight, first trap catch: June 28
Optimum 2nd generation - first treatment date, if needed: July 03,
Optimum 2nd generation - second treatment date, if needed: July 10

Redbanded Leafroller
Peak catch and approximate start of egg hatch: July 07

Spotted Tentiform Leafminer
Optimum second optimized sample date for 2nd generation STLM sapfeeding mines, if needed: July 10. Third optimized sample date for 2nd generation STLM sapfeeding mines, if needed: July 21

DISEASES

ROY, IT'S ROT OUT!

SUMMER FRUIT ROTS
(Bill Turechek and Dave Rosenberger, Plant Pathology, Geneva & Highland)

❖❖ Apple fruit rots have started to appear in some orchards. The wet spring that was punctuated with an unusually long bloom period has caused some diseases to appear earlier than would be expected under "normal" conditions. Being able to correctly identify which disease you are dealing with is important because control measures differ for the different diseases. In this article, we will discuss tactics for managing fruit rots caused by black rot, white rot, bitter rot, and two less common diseases: dry eye rot and calyx end rot. Black rot and white rot are capable of causing damaging cankers, but this stage of the disease will be covered only briefly in this article. For more information about managing black and whit rot cankers, see Scaffolds Fruit Journal Vol. 9 No. 3, or visit www.nysaes.cornell.edu/ent/scaffolds/.

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scaffolds
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Black Rot and White Rot are the two most common summer fruit rots in New York. Black rot is caused by the fungus *Botryosphaeria obtusa.* The fungus is capable of infecting blossoms and leaves (causing frog-eye leaf spot) as well as woody tissue. Black rot has become more problematic in New York over recent years because many growers have scaled back their apple scab fungicide program to the point where they are controlling apple scab with minimal rates (< 3 lb/A) of mancozeb fungicides applied alone. Mancozeb at higher rates offers some control of black rot; however, at these lower rates it is relatively ineffective against this disease when disease pressure is high. The SI fungicides are ineffective against black rot.

Black rot inoculum can originate from colonized dead wood within the tree or from mummified fruit and fruitlets. Fruitlets that are killed by thinning sprays but remain in the tree are an especially common source of inoculum. If black rot infections appear on the sides of growing fruit at this time of year, the source of inoculum can often be traced to one or more killed fruitlets located above the infection site within the tree canopy. Wood killed by fire blight either last year or earlier this year can also serve as inoculum sources.

Fruit with black rot infections at the calyx end usually result from sepal infections that occurred early in the season. These infections, which may happen as soon as the bud scales loosen, typically develop into blossom end rot (Figure 1). Rot around the core or seed cavity is another symptom of early season infection associated with infection of the carpel, especially in cultivars with 'Delicious' parentage. (Black rot is one of several different fungi that may be present in fruit with moldy core.) Seed-cavity infections often lead to premature fruit drop within 1 month after petal fall. However, some infected fruit may continue to grow until mid-summer when these fruits will usually color early, mature, and drop from the tree 3–6 weeks in advance of healthy fruit.

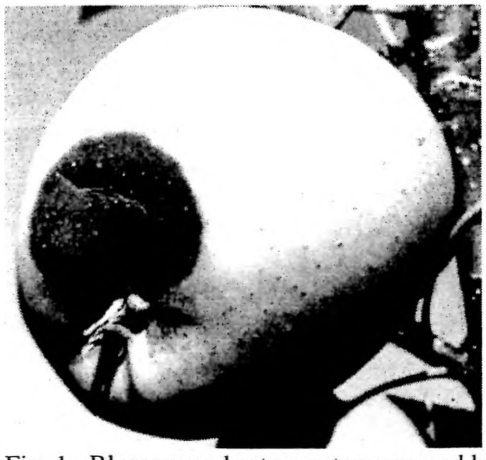

Fig. 1. Blossom end rot symptoms caused by *B. obtusa*

Late fruit infections occur through cracks in the cuticle, wounds and lenticels. Lesions on mature fruit enlarge rapidly, becoming black and irregular in shape, occasionally bordered by a red ring. These lesions can be infection courts for secondary pathogens. A series of concentric bands alternating in color from brown to black forms as the rotted fruit enlarges. The flesh beneath the rot remains firm and leathery. Small dark fruit bodies, called pycnidia, often form on rotted fruit surfaces. Eventually infected fruit dry down to mummies, which remain attached to the tree, serving as inoculum sources in the spring.

White rot of apple is caused by the fungus *Botryosphaeria dothidea.* The fungus is ubiquitous in nature, causing diseases on a wide variety of other woody hosts such as birch, chestnut, willow, mountain ash, quince, pear, sweet gum, Rhododendron, grape, roses, stone fruit, blueberry, blackberry, currant and gooseberry. As with black rot, the white rot fungus can also infect woody tissue and cause cankers. The white rot fungus does not infect leaf tissue.

Fruit lesions become visible 4–6 weeks before harvest, and appear as small, circular, slightly sunken tan to brown spots, sometimes surrounded by a red halo on yellow skinned fruit. On red-pigmented fruit, the halo appears dark purple to black. Latent infections result in the formation of corky areas beneath the fruit epidermis. These latent infections may occur on immature fruit up to 7 weeks after petal fall. Expanding lesions develop in a cylindri-

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cal fashion to the fruit core, unlike bitter rot lesions, which tend to be V-shaped. Most rotted fruits drop, but some may shrivel and remain attached to the tree, serving as a source of inoculum for further fruit infection. Scattered clumps of black fruiting structures (pycnidia) develop on surfaces of fruit with advanced stages of white rot. Rotted fruit appear clear tan to light brown, soft, and watery under warm conditions (Figure 2). This "bleaching" of red-skinned apple cultivars during the decay process has led to the name "white rot." Fruit rot developing under cooler conditions is firmer and deeper tan in color, similar to black rot caused by *B. obtusa*.

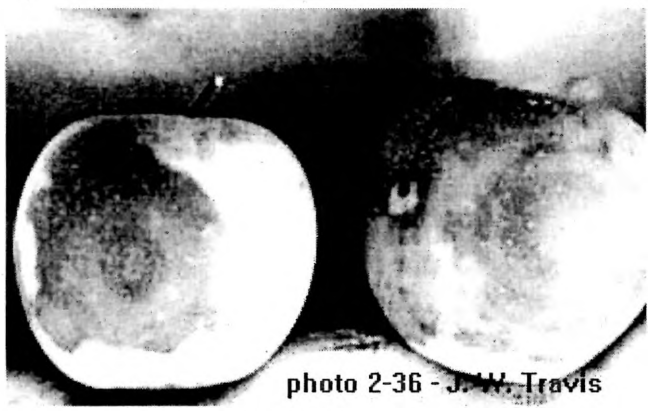

Fig. 2. Symptoms of white rot

At this point of the season, wounds provide the primary means of entry for these pathogens. Care should be taken to avoid wounding or pruning during periods when trees may also be subject to canker development through drought stress. Summer pruning in particular may increase the incidence of infection. Sanitation is the key to managing these diseases. Removal and destruction of infected branches, cankers and other sources of inoculum, such as mummified fruit, is highly recommended. Removal of current season fire blight strikes is also important, as they provide infection courts and a source of secondary inoculum. Applying a fungicide to pruning wounds or tree canopies may provide additional protection for growers. Captan, Benlate, and Topsin-M are the most effective fungicides for controlling black rot. Sovran and Flint are also effective.

Bitter rot is an important fruit rotting disease in the mid-Atlantic states and can be a problem in New York in summers when hot, humid weather predominates. The disease is caused by the fungus *Colletotrichum gloeosporoides* or *C. acutatum*. A number of hosts, including peaches, nectarines, grapes, strawberries, and blueberries are attacked by this pathogen. Anthracnose, a disease caused by the same pathogen, was prevalent in many strawberry fields this season, indicating that there is substantial inoculum available for infecting apple.

The disease begins as small, brown lesions as the fruit begin to develop, typically in early summer (Figure 3). Infection is favored by hot and wet conditions (such as those that we experienced in early June). Mature or wounded fruit are most vulnerable to infection, but fruit of any age can become infected if inoculum levels are high. At the optimum temperature of 78°F, infection of wet fruit can occur in as little 5 hours. One or more lesions may develop on infected fruit. Lesions are circular, can expand rapidly under favorable environmental conditions, and turn to a dark brown as they expand. As they age, lesions become sunken and begin to produce fruiting bodies when they reach approximately 3 cm in diameter. Spores are produced in a creamy white to pink matrix and often in concentric circles (Figure 4). Spores of the fungus are disseminated by splashing water (conidia) or wind or wind-driven rain (ascospores). The rotted flesh is often watery and appears V-shaped in cross-section. The fruit eventually dries and mummifies, after which it may fall to the ground or remain hanging from the tree throughout the duration of the winter.

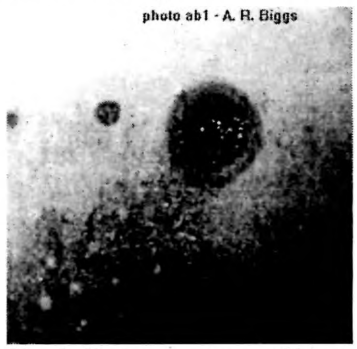

Fig. 3. Early symptoms of bitter r

Fig. 4. Advanced symptoms of bitter rot; note the concentric circles

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Sanitation is an important element of managing this disease. Mummified fruit and cankered wood should be removed to reduce inoculum sources. Wood cankered from other diseases and other dead branches should be removed as well because they serve as sites of entry for the pathogen. Regular fungicide applications from 1st cover through harvest on a 10–14-day schedule are usually necessary to effectively manage disease when inoculum levels are high or when hot, wet weather predominates. Captan and Flint are the most effective fungicides available for summer applications. Mancozeb is also very effective, but cannot be applied when fruit are at greatest risk of infection during late July and August. The benzimidazoles and SI fungicides are relatively ineffective. No apple variety is completely immune to the disease; however, some varieties like 'Fuji', 'Golden Delicious', and 'Empire' are more susceptible.

Dry eye rot (blossom end rot) and calyx end rot are diseases that appear when very wet weather occurs during bloom. Dry eye rot is caused by *Botrytis cinerea*, the "gray mold" fungus. Calyx end rot is caused by *Sclerotinia sclerotiorum*. The two diseases are often confused with each other because symptoms of both begin at the calyx end of the fruit and both cause a reddish discoloring at the site of infection (Figure 5). Usually, isolation of the pathogen is necessary for positive identification. Fruit infected with either of the pathogens have a tendency to drop prematurely. If harvested, though, fruit infected with dry eye rot will develop gray mold in storage. The diseases are typically minor and do not spread to other fruit once symptoms appear. Neither of these diseases spread during summer. Therefore, by the time these diseases appear it is too late to do anything about them.❖❖

Fig. 5. Symptoms of calyx end rot caused by *Sclerotinia*

INSECTS

READY TO RUMBLE

BAD BUG SMACKDOWN
(Art Agnello, Entomology, Geneva)

❖❖ There are many insects present in apple orchards that provide a benefit to growers by feeding on pest species. It is important that growers and orchard managers be able to recognize these natural enemies, so that they are not mistaken for pests. The best way to conserve beneficial insects is to spray only when necessary, and to use materials that are less toxic to them (see Tables 5 & 12, pp. 50 and 57 of the Recommends). This brief review, taken from IPM Tree-Fruit Fact Sheet No. 18, covers the major beneficial insects that are likely to be seen in N.Y. orchards, concentrating on the most commonly seen life stages. Factsheet No. 23, "Predatory Mites", reviews mites that are important predators of leaf-feeding mites.

CECIDOMYIID LARVAE (*Aphidoletes aphidimyza*)

This fly (Family Cecidomyiidae) is an aphid predator, and overwinters as a larva or pupa in a cocoon. Adults emerge from this cocoon, mate, and females lay eggs among aphid colonies. The adults are delicate, resembling mosquitoes, and are not likely to be seen. The eggs are very small (about 0.3 mm or 1/85 in. long) and orange. They hatch into small, brightly colored, orange larvae that can be found eating aphids on the leaf surface. These predacious larvae are present

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from mid-June throughout the summer. There are 3–6 generations per year. In addition to aphids, they also feed on soft-bodied scales and mealybugs.

SYRPHID FLY LARVAE (Family Syrphidae)

The Family Syrphidae contains the "hover flies", so named because of the adults' flying behavior. They are brightly colored with yellow and black stripes, resembling bees. Syrphids overwinter as pupae in the soil. In the spring, the adults emerge, mate, and lay single, long whitish eggs on foliage or bark, from early spring through mid-summer, usually among aphid colonies. One female lays several eggs. After hatching, the larvae feed on aphids by piercing their bodies and sucking the fluids, leaving shriveled, blackened aphid cadavers. These predacious larvae are shaped cylindrically and taper toward the head. There are 5–7 generations per year. Syrphid larvae feed on aphids, and may also feed on scales and caterpillars.

LADYBIRD BEETLES (Family Coccinellidae)

• *Stethorus punctum*: This ladybird beetle is an important predator of European red mite in parts of the northeast, particularly in Pennsylvania, and has been observed intermittently in the Hudson Valley of N.Y., and occasionally in western N.Y. *Stethorus* overwinters as an adult in the "litter" and ground cover under trees, or in nearby protected places. The adults are rounded, oval, uniformly shiny black, and are about 1.3–1.5 mm (1/16 in.) long. Eggs are laid mostly on the undersides of the leaves, near the primary veins, at a density of 1–10 per leaf. They are small and pale white, and about 0.3–0.4 mm (1/85 in.) long. Eggs turn black just prior to hatching. The larva is gray to blackish with numerous hairs, but becomes reddish as it matures, starting on the edges and completing the change just prior to pupation. There are 3 generations per year in south-central Pennsylvania, with peak periods of larval activity in mid-May, mid-June and mid-August. The pupa is uniformly black, small and flattened, and is attached to the leaf.

• Other Ladybird Beetles: Ladybird beetles are very efficient predators of aphids, scales and mites. Adults are generally hemisphere-shaped, and brightly colored or black, ranging in size from 0.8 to over 8 mm (0.03–0.3 in.). They overwinter in sheltered places and become active in the spring. Eggs are laid on the undersides of leaves, usually near aphid colonies, and are typically yellow, spindle-shaped, and stand on end. Females may lay hundreds of eggs. The larvae have well-developed legs and resemble miniature alligators, and are brightly colored, usually black with yellow. The pupal case can often be seen attached to a leaf or branch. There are usually 1–2 generations per year. One notable species that is evident now is *Coccinella septempunctata*, the sevenspotted lady beetle, often referred to as C-7. This insect, which is large and reddish-orange with seven distinct black spots, was intentionally released into N.Y. state beginning in 1977, and has become established as an efficient predator in most parts of the state.

LACEWINGS (Family Chrysopidae)

Adult lacewings are green or brown insects with net-like, delicate wings, long antennae, and prominent eyes. The larvae are narrowly oval with two sickle-shaped mouthparts, which are used to pierce the prey and extract fluids. Often the larvae are covered with "trash", which is actually the bodies of their prey and other debris. Lacewings overwinter as larvae in cocoons, inside bark cracks or in leaves on the ground. In the spring, adults become active and lay eggs on the trunks and branches. These whitish eggs are laid singly and can be seen connected to the leaf by a long, threadlike "stem". Lacewings feed on aphids, leafhoppers, scales, mites, and eggs of Lepidoptera (butterflies and moths).

TRUE BUGS (Order Hemiptera)

There are many species of "true bugs" (Order Hemiptera) such as tarnished plant bug, that feed on plants, but a number of them are also predators of pest species. The ones most likely to be seen are "assassin bugs" or reduviids (Family Reduviidae), and "damsel bugs" or nabids (Family Nabidae). These types of predators typically have front legs that are efficient at grasping and holding their prey.

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PARASITOIDS

Parasitoids are insects that feed on or in the tissue of other insects, consuming all or most of their host and eventually killing it. They are typically small wasps (Order Hymenoptera), or flies (Order Diptera). Although the adult flies or wasps may be seen occasionally in an orchard, it is much more common to observe the eggs, larvae, or pupae in or on the parasitized pest insect. Eggs may be laid directly on a host such as the obliquebanded leafroller, or near the host, such as in the mine of a spotted tentiform leafminer. After the parasitoid consumes the pest, it is not unusual to find the parasitized larvae or eggs of a moth host, or aphids that have been parastized ("mummies"). Exit holes can be seen where the parasitoid adult has emerged from the aphid mummy.

GENERALIST PREDATORS

There is a diversity of other beneficial species to be found in apple orchards, most of which are rarely seen, but whose feeding habits make them valuable additions to any crop system. The use of more selective pesticides helps to maintain their numbers and contributes to the level of natural control attainable in commercial fruit plantings. Among these beneficials are:

- Spiders (Order Araneae): All spiders are predaceous and feed mainly on insects. The prey is usually killed by the poison injected into it by the spider's bite. Different spiders capture their prey in different ways; wolf spiders and jumping spiders forage for and pounce on their prey, the crab spiders lie in wait for their prey on flowers, and the majority of spiders capture their prey in nets or webs.
- Ants (Family Formicidae): The feeding habits of ants are rather varied. Some are carnivorous, feeding on other animals or insects (living or dead), some feed on plants, some on fungi, and many feed on sap, nectar, honeydew, and similar substances. Recent research done in Washington has shown certain species (Formica spp.) of ants to be effective predators of pear psylla.
- Earwigs (Family Forficulidae): Although these insects may sometimes attack fruit and vegetable crops, those found in apple orchards are probably more likely to be scavengers that feed on a variety of small insects.❖❖

AUTHOR, AUTHOR!

❖❖ Last week's article on "Revised cumulative risk assessment for the OP pesticides" neglected to provide the appropriate author attribution. This summary was contributed by Glenn Morin (NE Fruit Consultants, Montague, MA), who attended the June 18 EPA technical briefing on this important issue. Our thanks to Glenn, and apologies for the oversight.❖❖

ERRATUM

PEST FOCUS

Geneva: **Spotted tentiform leafminer** 2nd flight coming to an end. **Lesser appleworm** trap catch increasing. **Spotted tentiform leafminer** 2nd flight began 6/24. DD (Base 43°F) since then = 652 (Sample sap-feeding mines @ 690 DD_{43}).

Highland: **Pear psylla** numbers decreasing while **pear rust mite** is increasing. **Apple maggot** trap catches low. **Potato** and **rose leafhopper** over threshold. **Redbanded leafroller** and **oriental fruit moth** nearing peak numbers. **Spotted tentiform leafminer** 2nd flight coming to an end.

scaffolds
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UPCOMING PEST EVENTS

	43°F	50°F
Current DD accumulations (Geneva 1/1–7/15):	1801	1188
(Geneva 1/1-7/15/2001):	1761	1158
(Geneva "Normal"):	1722	1163
(Highland 1/1–7/15):	2177	1462

Coming Events:	**Ranges:**	
Apple maggot 1st oviposition punctures	1566–2200	1001–1575
American plum borer 2nd flight begins	906–1895	967–1337
Oriental fruit moth 2nd flight begins	1152–1819	772–1215
Comstock mealybug 1st flight peak	1327–1782	824–1185
Comstock mealybug 1st flight subsides	1668–2245	1101–1450
Codling moth 2nd flight begins	1355–2302	864–1549
San Jose scale 2nd flight begins	1449–1975	893–1407
Obliquebanded leafroller 1st flight subsides	1420–2452	899–1790
STLM 2nd gen. tissue feeders present	1504–2086	952–1201

INSECT TRAP CATCHES (Number/Trap/Day)

Geneva, NY

	7/8	7/11	7/15
Redbanded leafroller	2.3	3.0	1.0
Spotted tentiform leafminer	225	87.8	27.9
Oriental fruit moth	8.0	2.0	1.3
Lesser appleworm	15.7	6.3	30.0
Codling moth	6.3	3.8	1.0
San Jose scale	0.0	0.0	0.0
American plum borer	0.5	0.3	0.0
Lesser peachtree borer	2.0	2.0	1.9
Peachtree borer	1.2	0.8	1.0
Dogwood borer	0.2*	0.0	0.0
Pandemis leafroller	0.0	0.0	0.0
Obliquebanded leafroller	0.3	0.2	0.0
Apple maggot	0.2*	0.0	0.0

Highland, NY

	7/5	7/15
Redbanded leafroller	4.5	7.4
Spotted tentiform leafminer	161.1	68.3
Oriental fruit moth	0.9	1.9
Codling moth	2.3	0.6
Lesser appleworm	1.3	1.3
Tufted apple budmoth	0.0	0.1
Variegated leafroller	0.3	0.0
Obliquebanded leafroller	1.2	1.5
Apple maggot	0.0	0.1
Sparganothis fruitworm	0.6*	0.4
Tufted apple budmoth	0.0	0.1
Dogwood borer	2.0	0.8

* first catch

NOTE: Every effort has been made to provide correct, complete and up-to-date pesticide recommendations. Nevertheless, changes in pesticide regulations occur constantly, and human errors are possible. These recommendations are not a substitute for pesticide labelling. Please read the label before applying any pesticide.

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