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Update on Pest Management and Crop Development

FRUIT JOURNAL

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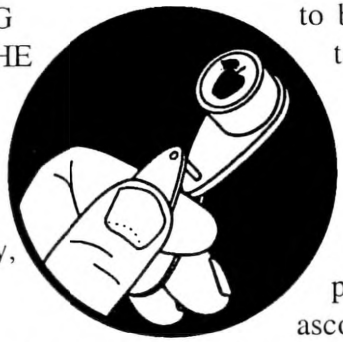
DISEASES

## AIN'T OVER 'TIL... DETERMINING THE END OF THE PRIMARY APPLE SCAB SEASON



(Dave Rosenberger, Plant Pathology, Highland)

❖❖ Apple growers should not reduce fungicide coverage just because we are approaching the end of the ascospore discharge season. During the period between petal fall and the third cover spray, apple leaves and fruit remain highly susceptible to scab infections, and even "clean" orchards remain at risk for secondary scab infections. The remainder of this article explains methods for predicting the end of ascospore discharge, along with reasons for ignoring this seasonal milestone when planning fungicide strategies.

In New York State, two different methods have been used to assess apple scab ascospore maturity and discharge. The older method involves collecting leaf litter from beneath apple trees at regular intervals during spring, removing apple scab pseudothecia, and evaluating the contents of the pseudothecia under the microscope. In 1985, MacHardy and Gadoury published a degree-day model for predicting apple scab ascospore discharge. Determining ascospore maturity with the degree-day model is much easier and faster than making determinations via squash mounts.

The degree-day model uses the green tip stage of bud development as a starting point. In some years, environmental conditions prior to green tip cause scab pseudothecial development to be slightly advanced or slightly retarded as compared with the "average" development assumed by the degree-day model. In years when ascospore maturity at green tip is more advanced than normal, fungicide protection at green tip is essential for protecting the crop. In years when ascospore maturity at green tip is delayed, apple growers can omit one or two early sprays. The old method of assessing spore maturity via squash mounts can provide better information than the degree-day model for the first 7–10 days of the growing season. After that, the degree-day model provides acceptable estimates of spore maturity.

Pseudothecial squash mounts are actually much less reliable than the degree-day model for predicting the end of the primary scab season most years. Many researchers (Gadoury,

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MacHardy, Rosenberger) have noted that the number of ascospores usually drops to zero at or shortly after petal fall, despite the fact that squash mount counts may still show significant number of ascospores in leaf litter. Rotorod trapping data from Al Jones in Michigan also show that ascospore captures usually end near petal fall. Not surprisingly, the degree-day model usually shows that ascospore discharge terminates at or soon after petal fall.

Squash mount data nearly always shows ascospores remaining in leaf litter when the degree-day model indicates that no more discharge should be expected. Why do the two systems provide different data about the end of the scab season? First, some of the "late" ascospores are never discharged under field conditions, or they fail to become airborne. Second, squash mount data does not compensate for the disappearance of leaf litter during spring. Squash mount assessments after petal fall may indicate that the remaining leaf litter still contains 16% of the total ascospore load. However, if 75% of the leaf litter has disintegrated, the real proportion of the full-season spore load remaining would be only 4%. We do not have a reliable method for evaluating "average" leaf litter disappearance in commercial orchards, and leaf litter disappearance has never been incorporated into squash mount counts. As a result, squash mounts have always over-estimated ascospore dose after petal fall.

The degree-day model may underestimate the proportion of remaining ascospores after petal fall in years when extended periods of dry weather occur between green tip and petal fall arrest pseudocethecial development in leaves. (This was the case in 2001, but does not appear to be the case in 2002.) Pseudothecial development slows or stops when leaves become dry (brittle), but the degree-day model does not take leaf drying into account. In exceptionally dry years, the old squash mount method can be used along with tower discharge tests to determine if spores are still being discharged. In normal or wet years, the degree-day model will be more accurate than the late-season squash mounts.

The fact that the traditional squash mount assessments erroneously predicted an extended period of ascospore discharge might have benefited apple growers. Growers have been trained to believe that a tight spray program (7–10-day spray intervals) is needed until all scab ascospores have been discharged and that there is little risk of scab infection after all ascospores are discharged. In reality, a tight spray schedule is usually needed for 2–3 weeks after petal fall, not because ascospores are discharged after petal fall, but rather because of the high risk posed by conidia during the period between petal fall and 3rd cover.

Just a few primary lesions that "escape" early sprays are sufficient to cause considerable damage if trees are left unprotected after petal fall. It is impossible for a grower or an IPM scout to detect scab if the incidence is very low. As a result, orchards that are apparently "clean" at petal fall can still develop a lot of scab if they are not protected with fungicides. When this occurs,

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**scaffolds**

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folks tend to blame the infections on "late primary scab", whereas in most cases these infections are actually secondary infections coming from undetected primary lesions somewhere in the tree.

When squash mount data was routinely available, growers protected trees beyond petal fall on the premise that they were still controlling primary scab. That fungicide timing strategy was sound, even if the "science" behind the strategy was faulty. Today we know that the primary scab season usually terminates near petal fall, but that fungicide protection after petal fall is still essential for controlling scab.

The bottom line is that knowing the end of the ascospore discharge period is of little practical importance, except in very dry years when the end of ascospore discharge can sometimes be delayed well past petal fall. In normal and wet years, the ascospore supply will be depleted long before anyone can be certain of their success in controlling earlier primary infections. Therefore, fungicide coverage is nearly always needed through second cover to protect the highly susceptible fruitlets and new rapidly expanding leaf tissue from potential secondary scab infections. The only exceptions might be blocks where frost damage has destroyed the crop and a low level of leaf scab will not pose any risk to fruit.❖❖

## ROTTIN' WEATHER

DISEASE UPDATE
(Bill Turechek,
Plant Pathology, Geneva)

❖❖ Every season has its oddities. This year, the record heat that pushed many apple trees from half-inch green to pink in two days was followed, first by one or perhaps two damaging frost events, then by weeks of cool and rainy weather that resulted in an extended bloom period. Luckily, cool and wet weather is not particularly favorable for fire blight infection. However, prolonged wetting, despite the cool temperatures, is favorable for apple scab. And although growers attempted to spray ahead of the rains, the soggy soils or the windy days that filled the gaps between rainy periods prevented spraying or certainly adequate spray coverage. Under these conditions, one can't help but wonder whether apple scab (or perhaps fire blight) may be more severe this year than what we would normally expect under cooler conditions.

So at this point in the season we are faced with two possible scenarios: Managing disease as usual or managing disease in frost-injured blocks. However, because it is too early to assess the true extent of injury related to frost, let's assume that both kinds of blocks are equally important for now and proceed with the assumptions that we were unprotected for at least one of the past infection events and that new apple scab lesions **have developed** but are not obvious without scouting. That is, secondary spores are now causing infections.

To date, we had a significant scab infection on Thursday (May 9) with showers starting early in the morning across the region, and a total of 10–11 hours of leaf wetness west of Rochester and as few as 6 hours of wetness east of Rochester. Rain began again on Sunday morning and is expected to continue until Tuesday. The ascospore degree day maturity model is predicting that greater than 75% of the ascospores have matured in western NY, and nearly 100% have matured in the Hudson Valley. In spore trapping counts that I have been doing in Geneva, I have seen substantial releases for the rain event on Thursday and the one beginning Sunday morning (May 12). So let's assume that the primary scab season is not over, but also that secondary cycles of infection are as important as primary infections at this point in the season. That is, assume that ascospores and conidia from new infections are contributing equally to infections over the next week.

The forecast tells us that we should expect rain or showers for most of this week, perhaps with a break around Wednesday. If you applied Sovran or

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Flint or a combination of SI plus mancozeb on Tuesday (May 8), you were covered for the infections on Thursday and for the current infection event. If on Saturday you were able to apply a fungicide in anticipation of this week's weather, you are in good shape. If we get a break on Wednesday, Sovran (1.6 oz/100 gal) or Flint (0.8 oz/100 gal) should, without question, be applied. Either fungicide will offer some after-infection activity, provide an excellent level of protection during the anticipated rains expected after Wednesday, and are the best choice for protecting against fruit scab. Fire blight should not be a concern. The temperature has been too cold to allow the bacteria to develop to a high enough level to cause infection.

For peaches or cherries, the latest timing for Rovral application is petal fall on cherries, peaches, and apricots with 24 hours post infection activity. The last window for Bravo (or Echo) is shuck split, which is also recommended for black knot control in cherries and plums. Peaches at petal fall can be protected using captan through the wet conditions. The SI's (Indar, Orbit, Elite) are labeled for blossom blight but are best if saved for fruit rot phase of brown rot. On peaches, bacterial spot is also of great concern when we experience this much rain. In blocks that have a history of spot, I would recommend using Mycoshield 17W (0.75 lb/acre) beginning at shuck split and continuing on a 7–10-day schedule as long as the weather remains wet. In blocks with less pressure, a low labeled rate of copper (such as Kocide 101 (1.0 lb/acre) or Kocide 2000 (0.75 lb/acre) plus Ziram 76DF (3.0 lb/acre) is another option. However, phytotoxicity is always a concern when applying copper to actively growing tissues, especially when applied in hot weather (not likely) or under poor drying conditions.❖❖

## A BURR IN YOUR SADDLE

### AMERICAN PLUM BORER AND DOGWOOD BORER IN APPLES

(Dave Kain, Entomology, Geneva and Dick Straub, Entomology, Highland)

INSECTS

❖❖ If you grow tart cherries, you've seen trees with gaping splits in the bark that you probably attributed to shaker damage or southwest injury. While it's true that bark damage originates from these injuries, the culprit behind the severe damage that eventually girdles the tree is the larva of a moth called the American plum borer. Shakers are the primary reason for infestation by this pest. The insect can't invade without some sort of opening through the bark. Longitudinal splits in cherry bark are sometimes caused by the pressure of the shaker clamp. These splits then exude gum that attracts egg-laying females and opens the way to the cambium where the larvae feed. Because they occur in large numbers and because they feed in a horizontal manner, they eventually girdle the tree. Often the condition of the tree goes unnoticed because the bark remains intact even though the underlying inner bark is destroyed. Before being completely girdled, trees may lose major scaffolds. Or, they may be lost entirely because they fall over in windstorms or die during drought because they don't have enough inner bark left to withstand the moisture stress.

The American plum borer overwinters as a larva inside a silken cocoon underneath the bark. If loose bark is peeled back, sometimes large numbers of these white cocoons can be found clinging to the inside of the bark. In the spring, larvae resume feeding along the edge of the inner bark until they mature and pupate. The first flight of adults begins at about the time that Montmorency is at the white bud stage. The peak of the first flight is usually at about petal fall or shortly thereafter. The first larval generation is present from about mid-June to mid-July. The

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second flight begins in mid- to late July. The second larval generation, which is the overwintering brood, begins in August.

In 1994, we decided to conduct a survey of American plum borer in New York State stone fruit orchards. With the help of growers, Extension agents and others, we set traps out in tart cherry, peach and plum orchards in important stone fruit growing areas in western New York, the Hudson Valley and Long Island. Where moths were caught, we also dug around under the bark looking for larvae. In tart cherry and one western New York peach orchard infected with canker (which also opens the way for borers to invade), plum borer was the most abundant borer. While there usually were only 2–3 clearwing borer larvae per tree, there were anywhere from a couple, up to a high of about 40 plum borer larvae per tree. American plum borer was not abundant, although we did catch some adults, in the Hudson Valley and on Long Island. Presumably, plum borer populations have built up in mechanically harvested tart cherries in western New York and have spread to some other susceptible trees, such as peaches infected by cankers. Plum borers may contribute to the spread of these diseases, as well. Because we found a large number of them in the one peach orchard included in the 1994 survey, we decided to conduct another survey, in 1995, of peaches infected with cankers. We conducted that survey in Niagara County because of the concentration of peach orchards there, and their proximity to infested tart cherry orchards. While clearwing borer larvae were prevalent, plum borer was present in all of the orchards surveyed.

Observations a few years ago of American plum borer infesting burrknots on apple trees prompted us to conduct a similar survey on apples in western NY (Wayne and Orleans Counties) and the Hudson and Champlain Valleys. American plum borer is virtually absent from regions other than western NY and dogwood borer is the prevalent borer throughout New York. However, near infested tart cherry and peach orchards, and even old stumps of these trees or wild cherry trees, American plum borer is sometimes more numerous, especially where plastic, spiral mouseguards are in place. Mouseguards apparently have little or no influence on dogwood borer infestation.

In apple, borers gain entry primarily through burrknots that form on the above-ground part of dwarfing rootstocks. They may feed on tissues within the burrknot, which is thought to be the least harmful type of feeding. But, they may move outward from there to feed on the inner bark. Both borers can eventually girdle the tree. They may also invade at the graft union. Where present, American plum borer is probably greater cause for concern because it is larger and more voracious, is usually more abundant within a particular wound and feeds in a more girdling fashion. Researchers in California have noted that American plum borer infestation of young pecan trees has led to death of the young trees or crotch splitting later in the life of the tree. Dwarf apple trees infested at the graft union may suffer similarly.

In trees with burrknots or other bark injury, look for reddish-brown frass being excreted to indicate whether borers are present. Carefully remove burrknot tissue or bark until the borer larva is revealed. Dogwood borer larvae are creamy white with a yellowish-brown head capsule and the last instar is about half an inch long. American plum borer larvae range from blackish-green to blackish-purple with a yellowish-brown to dark brown head capsule and are about three-quarter to one inch long in the final instar. American plum borers also have long hairs projecting from the body at right angles. Identification is important because the timing of control measures is different for the two species. There are IPM Fact Sheets available containing photos of the different life stages of each species (see pp. 219–220 in the Recommends; online versions are at: http://www.nysipm.cornell.edu/factsheets/treefruit/index.html.)

Past recommendations called for one trunk spray of Lorsban in mid-July to mid-August, or

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two applications of Thiodan — one in early July and one in early August for control of dogwood borer, which begins flying in mid-June. Because the peak of the first flight of American plum borer occurs at about the end of May, these summer sprays will miss the first generation of this pest. In tart cherry, researchers in Michigan determined that Lorsban 4E was the best material for control of American plum borer, and would control the peachtree borers, as well. They recommended application at tart cherry petal fall. This timing is usually a little earlier than trunk sprays for the clearwing borers would go on, but Lorsban 4E is persistent in wood, so it will control borers that are present later than the petal fall application, without missing the peak of the first plum borer flight. In fact, they felt that just the petal fall application would be sufficient for the entire season.

In apples, we conducted trials in 2000 and determined that Lorsban applied as a coarse trunk spray at petal fall was effective against both American plum borer and dogwood borer season-long. In addition, Lorsban apparently penetrated burrknot tissue and killed overwintered borers concealed within, preventing feeding damage that would have occurred prior to the traditional timing of dogwood borer sprays. Last year we looked at even earlier timings (half-inch green and pink) of Lorsban application because of the threatened loss of Lorsban for all postbloom use. Lorsban worked well at both prebloom timings, which some growers may find a more convenient time to apply trunk sprays, in addition to preventing early-seasaon feeding by these pests. For now (and over the next 2 years), the EPA has granted an ammendment to the Lorsban label to allow postbloom use as a trunk spray, up to twice per season, for the control of these borers. A final determination on this registration will be made after some residue trials currently being conducted through the USDA IR-4 program. We would suggest you take advantage of the opportunity to use Lorsban where you need it this season because it is the superior insecticide for this use. We are looking at other materials, as well, as a backup in case we lose the use of Lorsban altogether.

The best control of borers in apple is to avoid the development of burrknots in the first place. Where there are no burrknots, there are no borers. When establishing a new orchard, planting so that the graft union is about 2 inches from the soil surface will help any burrknots that do form to establish roots. Because what would have been burrknots and root initials become roots, this will decrease the number of burr knots. In established orchards with burrknots, soil can be mounded up to within a couple of inches of the graft to accomplish the same thing. Mounds must be wide enough to prevent freezing injury to the buried rootstock. In either case, care must be taken to avoid planting too deeply, allowing the development of scion roots. Some agricutural chemicals, such as NAA, can increase the expression of burrknots. Weed control around the trunk is important, too, because shade and increased humidity promote the development of burrknots. Plastic spiral mousegaurds may contribute substantially to problems with American plum borer in orchards near stone fruit plantings.

Borers in tree fruits may be thought of as unimportant or secondary by many because the damage they cause is less visible and less immediately threatening. However, over the long run, they can substantially decrease the lives of trees. It is estimated that the lives of tart cherry trees infested by American plum borers are shortened by about one-third. Young trees may be killed outright, or weakened and deformed later in their lives. Although it is harder to quantify, borers may also reduce tree vigor and yield and open the way for increased disease problems. (We've begun working to determine the effects on dwarf apple tree yield and growth over the next 5–10 years.) And, we are receiving increasing complaints about borers. Maybe it's time to start paying them more attention.❖❖

## PEST FOCUS

Geneva:
1st **mullein plant bug** nymphs observed 5/8.

Peru (Clinton Co.): **Green pug moth** (GPM) larval infestation noted feeding on bud clusters in a block of McIntosh trees, 7 May. This geometrid, *Chloroclystis rectangulata*, is an introduced European species common in Nova Scotia that has now been found in New England, New York and New Jersey. The yellow-green larvae are inchworms that bore into blossom buds to feed, preferring flower anthers. One larva can damage several flowers and, where numerous, can significantly reduce fruit set. Most larvae finish feeding by petal fall, by which time they usually have a dark red-brown stripe along the back. The moths fly in June and July. Nova Scotia recommends an OP at tight cluster to early pink if there are 6 or more GPM larvae per 100 fruit clusters.

Highland:
**Spotted tentiform leafminer** sap-feeding mines observed.

## PHENOLOGIES

Geneva:
Apple (McIntosh): Petal fall
Apple (Red Delicious): Bloom
Pear (Bartlett): King fruit set
Peach: Petal fall, shucks on
Tart cherry (Montmorency): 25% petal fall
Sweet cherry: Fruit 6mm

Highland:
Apple (McIntosh): Fruit 8mm
Apple (Red Delicious): Fruit 4mm
Pear: Fruit 12 mm

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

### Geneva, NY

| | 5/6 | 5/9 | 5/13 |
|---|---|---|---|
| Green fruitworm | 0.0 | 0.0 | 0.0 |
| Redbanded leafroller | 1.0 | 4.2 | 1.3 |
| Spotted tentiform leafminer | 103.2 | 89.7 | 13.8 |
| Oriental fruit moth | 32.0 | 49.5 | 7.6 |
| Lesser appleworm | 79.2 | 51.3 | 5.6 |
| Codling moth | 0.0 | 0.0 | 0.0 |

### Highland, NY

| | 5/6 | 5/13 |
|---|---|---|
| Green fruitworm | 0.0 | 0.0 |
| Redbanded leafroller | 4.1 | 3.7 |
| Spotted tentiform leafminer | 10.0 | 4.4 |
| Oriental fruit moth | 4.0 | 4.5 |
| Codling moth | 0.0 | 0.4 |
| Lesser appleworm | 0.0 | 0.6* |
| Tufted apple budmoth | 0.0 | 0.0 |
| Variegated leafroller | 0.0 | 0.0 |

* first catch

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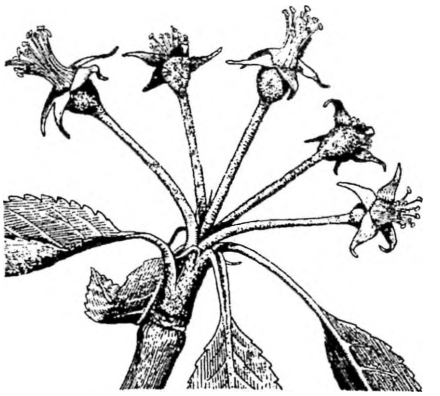

## UPCOMING PEST EVENTS

| | 43°F | 50°F |
|---|---|---|
| Current DD accumulations (Geneva 1/1–5/13): | 456 | 238 |
| (Geneva 1/1-5/13/2001): | 459 | 275 |
| (Geneva "Normal"): | 407 | 202 |
| (Highland 1/1–5/13): | 664 | 359 |

| **Coming Events:** | **Ranges:** | |
|---|---|---|
| San Jose scale 1st catch | 189–704 | 69–385 |
| Spotted tentiform leafminer sap-feeders present | 295–628 | 130–325 |
| Spotted tentiform leafminer 1st flight subsides | 489–978 | 270–636 |
| Tarnished plant bug adults active | 71–536 | 34–299 |
| Comstock mealybug 1st gen. crawlers in pear | 220–425 | 82–242 |
| American plum borer 1st catch | 194–567 | 55–294 |
| Codling moth 1st catch | 273–805 | 141–491 |
| Mirid bugs 50% hatch | 404–464 | 193–241 |
| European red mite summer eggs present | 448–559 | 235–320 |
| McIntosh at fruit set | 467–648 | 242–339 |
| Peach at shuck split | 362–518 | 174–287 |
| Pear at fruit set | 437–592 | 227–320 |
| Tart cherry at petal fall | 385–563 | 185–289 |

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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