scaffolds Update on Pest Management and Crop Development

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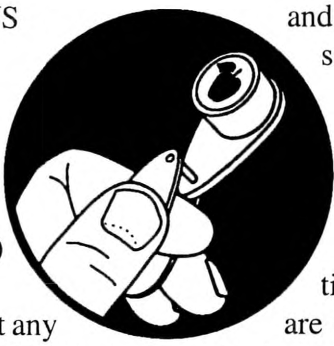
DISEASES

BARK BANE

CANTANKEROUS CANKER DISEASES
(Cathy Heidenreich & Bill Turechek, Plant Pathology, Geneva)



❖❖ Take a walk through almost any sweet cherry or peach orchard in New York and it quickly becomes obvious that something is wrong. Large open wounds oozing with amber colored gum, trees mangled from excessive pruning, and stumps of trees long since removed scattered throughout the orchard are a common sight in many New York orchards. In nearly all cases, this damage was caused by canker-causing pathogens. Canker diseases are an important production problem and account for significant losses of fruit-bearing surfaces where numerous infections occur or cankers are large. In New York, there are two major canker diseases, perennial canker (also known as Cytospora, Leucostoma, Valsa or fungal canker) and bacterial canker.

Perennial canker is the major canker disease responsible for the early decline and death of peaches in New York, and to a lesser extent, sweet cherries. Perennial canker is caused by fungi in the genus *Leucostoma.* In mature peach orchards, *L. cincta* is commonly found infecting nodes on 1 year-old shoots, leaf scars, and dead buds. It also causes a decline in sweet cherry. *L. persoonii* is most commonly isolated from peach and cherry pruning wounds. The two fungi have quite a wide host range, including other species within Rosaceae (the Rose family) and species outside of it. Some of their other hosts include: Sitka mountain ash, black, flowering, pin, sour and Japanese cherries, chokecherry, Damson, common, wild and cultivated plums, prunes, apricots, and golden willow.

Perennial canker symptoms on peach vary, depending on the infection location. Small twig infections are usually found around winter-killed buds or leaf scars. They appear as sunken discolored areas with alternating zonation lines. Infections at nodes appear 2–4 weeks after bud break and ooze amber gum unless the twig is killed. Branch or twig infections may develop leaf symptoms during the growing season. Leaves often turn yellow, droop, wilt and die. Dead twigs and branches, and canker margins become covered with pinhead-sized black structures coming out through the bark (Fig. 1). These are pycnidial stroma and are the reproductive structures of the fungus. Under moist conditions, these structures exude flesh to orange colored tendrils (cirri), which contain thousands of spores

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Fig 1.

(conidia). Main trunk and branch infections usually start in pruning wounds or winter-killed tissue. From these points of entry the cankers slowly expand and girdle infected trunks or branches. Small, weak shoots that develop in the centers of trees are especially susceptible. Cankers on the main trunk, older branches, scaffold limbs and in branch crotches are the most conspicuous evidence of the disease (Fig. 2). These cankers are elliptical in shape and exude excessive amounts of amber colored gum. As cankers age, the gum becomes dark brown and the bark dries and cracks open, exposing the blackened dead tissue beneath.

Fig 2.

During late spring and early summer, the active growth of the tree restricts canker enlargement. Often a callus ring is formed around the infection, preventing invasion of new tissue (Fig. 3). However, when the tree goes into dormancy, the fungus becomes active again and continues to infect surrounding healthy tissue. This yearly alternation of callus formation and tissue invasion leads to a very evident canker with concentric callus rings. Trees under stressed conditions may have more diffuse cankers, as they are unable to produce callus rings in self-defense.

Fig 3.

Bacterial canker is caused by the bacteria *Pseudomonas syringae* pv. *syringae* and *Pseudomonas syringae* pv. *morsprunorum*. The bacteria overwinter in bark tissue at canker margins, in apparently healthy buds and/or systemically in the vascular system. In the spring, bacteria multiply and emerge from their overwintering sites and are disseminated by wind and rain to blossoms and young leaves. In severe cases, infected buds emerge but are quickly "blasted" (Fig. 4). Bacteria of both pathovars can live in an epiphytic phase (i.e., live on plant tissues without causing symptoms) on blossoms and leaves from bloom through leaf fall in autumn. *P.s.* pv. *syringae* can also live epiphytically on a variety of weed hosts. During the

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scaffolds

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Fig 4.

spring and summer, epiphytic bacteria or those from wound sites enter the host through leaf stomata, enabling them to endure adverse environmental conditions during warm and dry periods. Under cool and wet conditions, the bacteria multiply profusely and induce disease symptoms and/or replenish epiphytic populations. The bacteria may reach axillary buds by systemic spread from infected leaves through the petiole throughout the season. Cankers subsequently appear at the base of infected buds. Canker expansion slows during winter but resumes again in early spring. The bacteria typically enter tree limbs and the trunk through pruning wounds and/or sites of freeze injury in autumn and early winter (Fig. 5 shows a young canker; Fig. 6 an advanced canker). Because cherries are vulnerable to winter injury, bacterial canker is particularly a problem in New York where winter injury is common. Canker expansion at these sites is similar to that described for axillary bud infection.

Fig 5.

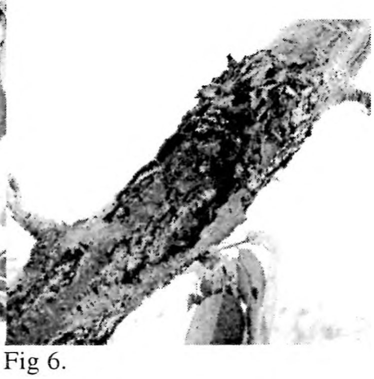

Fig 6.

Disease Management. Since canker symptoms are often indistinguishable, these two diseases are often confused with each other (compare Fig. 2 to Fig. 6), particularly on sweet cherry. Moreover, an infection initiated by one of the pathogens often predisposes a tree to infection by the other; as a result, these two diseases can often be found together on the same tree. This, however, is much more common on sweet cherry than peach or nectarine. How best to tell them apart? The presence of pimply pycnidia on the margins of perennial cankers or along the length of infected wood is probably the best clue, but is not always reliable, as pycnidia are not formed in all cases.

Although these two diseases are caused by pathogens on opposite ends of the biological spectrum (i.e., one is caused by fungi, the other by bacteria), disease management tactics are similar for both. Remember, both attack weak, injured, or dying trees. Thus, any practice or event that weakens or injures a tree, such as freeze injury, pruning cuts, and poor nutrition, promotes infection by these pathogens. Reduction of mechanical and winter injuries and other stresses will help to reduce your chances of infection. Pruning wounds are most susceptible to infection early in the dormant season, but spring pruning cuts may also become infected. There are no fungicides registered specifically for *Leucostoma* control, and those applied for peach leaf curl and brown rot control give only minimal reduction in perennial canker infections. Fixed-copper compounds are recommended for bacterial canker control; however, the optimum timing and effectiveness of copper compounds is not fully understood. (We are limited to when we can apply copper due to the phytotoxic effects.) Current label recommendations call for one autumn application "before heavy rains begin" and another at late dormant. A third application is also labeled for use shortly after harvest in orchards where disease is severe, but is sometimes discouraged due to the phytotoxic effects of copper.

The other important factor to consider in disease management is to reduce the amount of inoculum or disease pressure ***<u>in and around</u>*** your orchard. Pruning out cankers removes the source of disease for new cankers within your orchard, and eliminating wild hosts around the periphery of your orchard reduces disease pressure from outside sources. Sanitizing pruning instruments between cuts will reduce the chance of spreading disease through pruning cuts. The bottom line is that there are no silver

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bullets. Disease management is accomplished though a combination of well-timed horticultural and disease sanitation practices. The following checklist provides guidance to help minimize damage due to canker diseases.

• Establish new plantings at a distance and upwind from old cankered blocks.

• Plant on sites with deep, well-drained soils and good air drainage to minimize winter injury.

• Removal of wild *Prunus* species in hedgerows adjacent to sweet cherry orchards will help to reduce inoculum.

• Nursery stock should not be too large (11/16 caliper or smaller), and should be planted without delay upon receipt to minimize additional stress.

• Plant only disease-free nursery stock. Inspect trees before planting. Cut out any small cankers on lateral branches, removing at least 10 cm healthy tissue below the canker before planting.

Train to promote wide crotch angles, which will help reduce winter injury and breakage.

• Prune trees to open centers, eliminating small, weak shoots.

• Annual pruning should be done in June or July when trees are active. This allows pruning cuts to heal quickly. Prune if possible during warm, dry weather. Avoid leaving pruning stubs.

• All cankers should be pruned from trees and burned, buried or removed far from the orchard to reduce inoculum sources.

• Prune cankered limbs well below visible canker, avoid pruning in early spring and fall when bacteria are most active, and sterilize pruning tools before pruning healthy trees.

• Control oriental fruit moth, peachtree borer, brown rot and peach leaf curl diseases to reduce points of entry for the fungus. *This is particularly important during the establishment years!* Use wire tree guards to prevent rodent damage.

• The area around the base of young trees should be kept free from weeds and trash. This helps keep the trunk and crown dry and potentially reduces epiphytic populations of *P. s.* pv. *syringae*.

• Promote tree vigor! Use balanced nitrogen fertilization with adequate potassium. Do not overfertilize late in the season, as this delays winter hardening. Avoid water stress.

• White latex paint applied to the southwest sides of trunks and lower scaffold limbs may help to reduce winter injury (sunscald).❖❖

INSECTS

BORED TO TEARS?

AMERICAN PLUM BORER AND DOGWOOD BORER IN APPLES

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

❖❖ 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,

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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 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.

By now you're beginning to wonder why the title of this article states that it's about borers in apple. Recently, Debbie Breth (Lake Ontario Fruit Team) brought it to our attention that American plum borer was infesting burrknots on apple trees. Plum borer larvae were found in young (2–3-inch trunk diameter) dwarf apple trees in orchards near recently removed tart cherry orchards. In addition, borers (especially dogwood borer) seem to be an increasing problem in Hudson Valley apple orchards. In research conducted in the Hudson Valley in the 1980's on dogwood borer, American plum borer also was observed. Preliminary results of a survey we're currently conducting suggest that near infested tart cherry and peach orchards, and even old stumps of these trees or wild cherry trees, American plum borer is prevalent. In orchards more isolated from stone fruits, dogwood borer is more likely to be found.

In apple, borers gain entry 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

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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.

Past recommendations called for one trunk spray of Lorsban in mid-July to mid-August, or 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 last season 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. This year we are looking at earlier timings (half-inch green and pink) because of the threatened loss of Lorsban for all postbloom use. For now, 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. <u>However, at present we are awaiting final approval from the NYSDEC before it can be legally used.</u> If the DEC approves its use before the traditional mid-July to mid-August timing for dogwood borer, 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. It is becoming apparent, through surveys of a number of orchards last season, and growers' testimonials, that plastic spiral mousegaurds contribute substantially to problems with both borers.

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: **Pear psylla** hardshells present. 1st **codling moth** trap catch. 1st **San Jose scale** trap catch. 1st **lesser peachtree borer** trap catch. **Plum curculio** oviposition scars present on apple, 5/21.

Highland: 1st **variegated leafroller** trap catch. 1st **lesser appleworm** trap catch.

Hudson: **American plum borer** #/trap/day = 0.6.

UPCOMING PEST EVENTS

	43°F	50°F
Current DD accumulations (Geneva 1/1–5/21):	563	333
(Geneva 1/1-5/21/2000):	608	326
(Geneva 1/1–5/21 "Normal"):	525	273
(Highland 1/1–5/21):	692	417
(Hudson 1/1–5/21):	614	366

Coming Events:	Ranges:	
Lesser appleworm 1st flight peak	372–851	181–483
Oriental fruit moth 1st flight peak	259–606	96–298
San Jose scale 1st flight peak	457–761	229–449
Spotted tentiform leafminer sap-feeders present	295–628	130–325
American plum borer 1st flight peak	360–962	134–601
Mirid bugs hatch complete	532–720	252–390
Spotted tentiform leafminer 1st flight subsides	489–978	270–636

INSECT TRAP CATCHES (Number/Trap/Day)

Geneva, NY

	5/14	5/17	5/21
Redbanded leafroller	3.1	1.8	1.1
Spotted tentiform leafminer	242	181	45
Oriental fruit moth	55	69	22
Lesser appleworm	19.4	76	34
Codling moth	–	–	31.3*
San Jose scale	–	–	1.1*
American plum borer	1.1	1.0	1.3
Lesser peachtree borer	–	–	3.6*

Highland, NY

	5/14	5/21
Redbanded leafroller	15.5	3.6
Spotted tentiform leafminer	17.2	3.4
Oriental fruit moth	0.1	2.9
Codling moth	0.8*	1.4
Lesser appleworm	–	6.4*
Variegated leafroller	–	0.4*
Obliquebanded leafroller	–	0
Tufted apple bud moth	–	0

* first catch

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PHENOLOGIES

Geneva:
Apple (McIntosh): king fruit 5mm
Apple (Red Delicious): fruit set
Peach: shuck split
Plum: fruit 10mm
Pear: fruit 10mm

Highland:
Apple (McIntosh): king fruit 10mm

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