scaffolds

Update on Pest Management and Crop Development

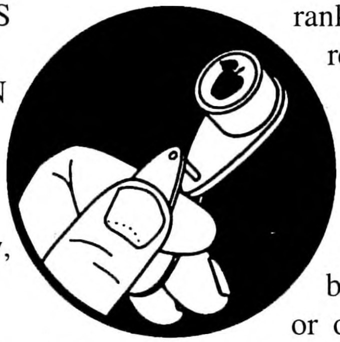
F R U I T J O U R N A L

July 10, 2000 VOLUME 9, No. 17 Geneva, NY

X-CLUED

THE TRUTH IS OUT THERE: X-DISEASE IN PEACHES AND CHERRIES

(Dave Rosenberger, Plant Pathology, Highland)



❖❖ X-disease is causing continued losses in some stone fruit orchards in the Hudson Valley. X-disease often follows a 10–15 year cycle in which extensive losses over a 4 to 6 year period are followed by a gradual decline in disease incidence until the next cycle begins. The reason for this cyclical pattern has never been determined. A significant increase in X-disease was noted in the Hudson Valley in 1997, and losses mounted in 1998 and 1999. The incidence of new X-disease infections may remain high for several more years before the current cycle reaches its zenith.

A general description of X-disease epidemiology and the symptoms that it causes was published in *Scaffolds* Vol. 8, No. 14, 21 June 1999. Most of that background information will not be repeated here. Instead, this article will include a review of some published literature on X-disease transmission and suggested approaches for reducing the spread of X-disease.

X-disease is caused by a phloem-limited mycoplasma-like organism (XMLO) — a minute pathogenic organism smaller than most bacteria. The XMLO is transmitted by at least eight species of leafhoppers found in New York, but two species predominate. *Scaphytopius acutus* is the most important vector in the Hudson Valley and Connecticut. *Paraphelpsius irroratus* ranks a close second. In Michigan, the relative importance of the two species is reversed. (White-apple leafhopper, rose leafhopper, and potato leafhopper are not vectors.) X-disease vectors acquire the XMLO while feeding on diseased chokecherry bushes, on infected sweet cherry trees, or on wild seedlings of sweet cherry. They may also acquire XMLO from some broad-leaf weeds and grasses, although the importance of weeds in X-disease epidemiology remains unclear. In the eastern United States, vectors do NOT acquire the XMLO from diseased peaches, probably because the titer of the disease organism within diseased peach trees is so low that leafhoppers do not encounter the organisms while feeding.

After leafhopper vectors feed on an infected plant, the X-disease organism must grow within the insect for at least 20 days before the insect can transmit X-disease to another plant. Once that

continued...

IN THIS ISSUE...

25-day incubation period is completed, however, the leafhoppers with X-disease remain infective for the rest of their lives. In laboratory studies, leafhoppers have often lived for 30–40 days after they become infective. A single infective insect therefore has the potential to infect numerous plants.

In work completed in Connecticut in the late 1970's, McClure (1980a) showed that *S. acutus* prefers to feed and breed on red clover, strawberry, blackberry and multiflora rose rather than on peach or chokecherry. *S. acutus* neither fed nor laid eggs on orchard grass. Adult *S. acutus* apparently move into peach trees from the ground cover or from border areas rather than completing their full life cycle on peaches. McClure (1980b) also showed that the total numbers of adult X-disease vectors (all species) in peach trees was dependent on the kind of groundcover in the orchard. Vector populations were at least 50% lower in peach orchards that had a pure grass groundcover than in peach orchards that contained herbaceous host plants for the leafhoppers.

In Michigan, Larsen and Whalon (1987) showed that the vector *P. irroratus* moves from ground cover into stone fruit trees at dusk, then returns to the ground cover at dawn. *P. irroratus* breeds on grasses in the ground cover. Nymphs feed on grass stems just above the soil line and therefore often escape exposure to insecticide sprays applied to orchard trees. Both *P. irroratus* and *S. acutus* have two generations per year with adult populations peaking in July and again in September.

The role of herbaceous weeds in X-disease epidemiology remains uncertain. Chiykowski and Sinha (1982) conducted greenhouse studies with caged leafhoppers. They showed that *P. irroratus* could transmit XMLO both to and from ragweed, lambsquarter, black mustard, red clover, Ladino clover, birdsfoot trefoil, narrow-leaf plantain, and several other herbaceous plant species. However, the importance of these weed hosts in the field spread of X-disease remains undocumented. McClure (1980b) reported that spread of X-disease was lower in orchards that did not have broadleaf weeds, but that difference may have been attributable to reduced vector numbers in orchards that lacked hosts suitable for vector reproduction.

Researchers in California studied the spread of X-disease in sweet cherry orchards from 1986 to 1990 to determine how removal of diseased trees and applications of residual insecticides to control vectors would affect spread of X-disease (VanSteenwyk, 1995). They found that removal of diseased trees as soon as infections were identified was the best way to slow spread of the disease. Removal of diseased cherry trees accounted for 75-84% of the reduction in disease spread whereas insecticide treatment to kill vectors accounted for only about 7% of the reduction. The strain of XMLO in California is slightly different from that in the eastern United States, and vector species and orchard ecology (irrigated versus non-irrigated) also differ between the two areas. However, the California work suggests that vector control alone will not provide good control of X-disease in sweet cherries.

continued...

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 3 pm Monday to:

scaffolds FRUIT JOURNAL
Dept. of Entomology
NYSAES, Barton Laboratory
Geneva, NY 14456-0462
Phone: 315-787-2341 FAX: 315-787-2326
E-mail: ama4@nysaes.cornell.edu

Editors: A. Agnello, D. Kain

This newsletter available on CENET at: news://newsstand.cce.cornell.edu/cce.ag.tree-fruit
and on the World Wide Web at:
http://www.nysaes.cornell.edu/ent/scaffolds/

The published literature on X-disease leaves many practical questions unanswered. Again, management decisions must be made based on "educated guesses" derived from published studies. I suggest that stone fruit growers in regions of the eastern United States where X-disease is a problem consider the following strategies to minimize losses to X-disease:

1. The most effective protection against X-disease is to isolate peach plantings and new cherry plantings from all of the known woody hosts for X-disease. Woody hosts that can contribute inoculum include older blocks of sweet cherries and tart cherries, as well as chokecherries and volunteer Mazzard seedling trees that may grow in hedgerows. A single infected chokecherry or Mazzard seedling within 500 ft of a young orchard can contribute enough inoculum to cause major losses.

2. Broadleaf weeds have been implicated both as host plants for reproduction of vectors and as potential inoculum sources of the XMLO. Importance of the latter in X-disease epidemiology is uncertain, but controlling these weeds is relatively inexpensive. Postharvest applications of 2-4D herbicide to the row middles will eliminate most broad leaf weeds. (In sweet cherries, this application should be made as soon as possible after harvest to eliminate broad leaf weeds before the second generation of vectors matures in September.) Because broadleaf weeds are the preferred hosts for the *S. acutus* vector, killing weed hosts with 2-4D could possibly stimulate movement of vectors into the trees and thereby contribute to the further spread of X-disease. To avoid that possibility, an insecticide that is effective for controlling leafhoppers should probably be applied at the same time that the 2-4D is applied.

3. Infected cherry trees should be removed as soon as X-disease symptoms are noted. This may be difficult with cultivars of cherry that do not produce distinct symptoms. However, failure to remove infected cherries almost guarantees a continuation of the epidemic.

4. In regions where X-disease is endemic, cherry growers may need to consider propagating cherry trees with Mahaleb stem pieces or on other rootstocks that will cause trees to die when they become infected. When sweet cherry trees propagated on Mahaleb rootstock become infected with X-disease, the scion variety dies back to the graft union within about a year after they are inoculated. This occurs because the Mahaleb rootstock is hypersensitive to the XMLO. In California, some sweet cherry growers have used high-budded trees on Mahaleb rootstock. A separate scion bud or graft is used to generate each scaffold limb. In these trees, X-disease in a single scaffold causes death of that scaffold without causing infection or loss of the entire tree. The advantage of this approach is that the inoculum source (infected cherry) dies fairly quickly after infection rather than persisting for many years as currently occurs when sweet cherries on Mazzard rootstocks become infected.

Sweet cherry trees on Mahaleb rootstock tend to have small fruit size. However, it might be possible to use a short Mahaleb stem piece or some other rootstock that is hypersensitive to X-disease. This approach would be particularly useful for eliminating X-disease from sweet cherry cultivars that produce indistinct symptoms. Propagating multi-piece trees might be cumbersome, but it deserves further research because growers can ill afford to lose young cherry blocks to X-disease just as these trees are coming into production.

In all probability, no single approach will provide adequate control of X-disease. An integrated approach that combines all or most of the actions suggested above may be the only effective way to reduce losses to X-disease in the Hudson Valley.

Literature cited:

Larsen, K. J., and M. E. Whalon. 1987. Crepuscular movement of *Paraphlepsius irroratus* (Say) (Homoptera: Cicadellidae) between the groundcover and cherry trees. Environmental Entomology 16:1103-1106.

McClure, M. S. 1980. Role of wild host plants in the feeding, oviposition, and dispersal of *Scaphytopius*

continued...

acutus (Homoptera: Cicadellidae), a vector of peach X-disease. Environmental Entomology 9:265-274.

McClure, M. S. 1980b. Spatial and seasonal distributions of leafhopper vectors of peach X-disease in Connecticut. Environmental Entomology 9:668-672.

Van Steenwyk, R. A., B. C. Kirkpatrick, A. H. Purcell, C. F. Fouche, J. A. Grant, and J. K. Uyemoto. 1995. Evaluation of an abatement program for western X-disease in sweet cherry. Plant Dis. 79:1025-1028.

❖❖

INSECTS

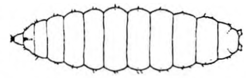
WORTHY OPPONENTS

INSECTS WITH ISSUES
(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 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. 34 and 42 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 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.

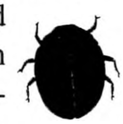


SYRPHID FLY LARVAE (Family Syrphidae)

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)

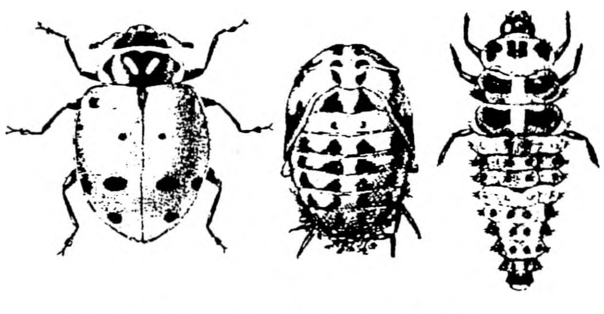
- *Stethorus punctum* - This ladybird beetle is an important predator of European red mite in parts of the northeast, particularly in Pennsylvania, and has been observed intermittently in the Hudson Valley of N.Y., and occasionally in western N.Y. *Stethorus* overwinters as an adult in the "litter" and 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



continued...

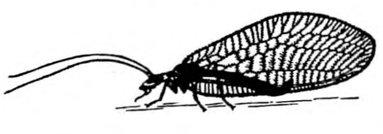
about 0.3–0.4 mm (1/85 in.) long. Eggs turn black just prior to hatching. The larva is gray to blackish with numerous hairs, but becomes reddish as it matures, starting on the edges and completing the change just prior to pupation. There are 3 generations per year in south-central Pennsylvania, with 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)

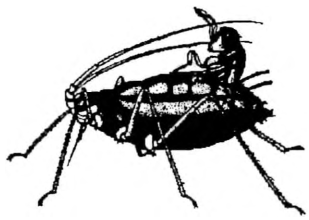
There are many species of "true bugs" (Order Hemiptera) such as tarnished plant bug, that feed on plants, but a number of them are also predators of pest species. The ones most likely to be seen are "assassin bugs" or reduviids (Family Reduviidae), and "damsel bugs" or nabids (Family Nabidae). These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

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,

continued...

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.❖❖

HOPPING MAD

HUDSON VALLEY INSECTS OF NOTE

(Dick Straub & Peter Jentsch, Entomology, Geneva)

❖❖ European red mite (ERM) are relatively scarce this season in most Hudson Valley orchards. As usual however, two-spotted spider mite (TSM) are very active and bronzing leaves. It is apparent that some miticides having good efficacy against ERM are not necessarily effective against TSM. The question of how to rescue blocks from TSM was answered last season by data from two trials at the Hudson Valley Lab. Under high TSM infestations (13 – 18 motiles/leaf, 3 AUG), we evaluated single sprays of most current miticides. AgriMek + oil (5 oz/100) produced 88.4% reduction of motiles — this material however, would be ill used as a rescue treatment, for a number of reasons. We were encouraged to find that Vendex 50W (8 oz/100) was highly effective, providing 98% reduction of motiles at 21 days postapplication. (We unfortunately did not include Kelthane in either trial — we are looking at it this season). Less encouraging results against TSM were provided by Pyramite (39% reduction) and Carzol (no effect). Vydate (16 oz/100) provided surprising efficacy (83% reduction), information that should help in those orchard situations requiring treatment for 2nd generation leafminer.

A remarkable note of this season is the dramatic increase in leafhopper populations. Rose leafhopper, which has been somewhere on vacation the last couple of seasons, has returned as a pest. The bigger story however, is potato leafhopper (PLH). We noted the first adult somewhat earlier than usual (5 JUN), and they have since built to unusually high numbers. Such populations of PLH present an array of control options and decisions.

continued...

Non bearing trees – Because rapid shoot extension is critical, leafhoppers, and PLH in particular, should be controlled. This is not always easy to accomplish, given that PLH are terminal feeders and elongating shoots rapidly produce new leaves that are not protected by previous insecticide sprays. Even quasi-systemic materials such as Provado do not provide residual protection. Control therefore, requires frequent applications to protect new foliage. If frequent applications (10–14 day schedule) are elected, it makes good economic sense to choose from any of the recommended contact insecticides for this purpose. Data from a recent trial however, suggests that Provado at the reduced rate of 0.5 oz/100 reduces hopper populations and protects new foliage reasonably well when applied on a 14 day schedule. Given that the recommended rate for leafhoppers is 1–2 oz/100, the reduced rate renders Provado more economically attractive.

Bearing trees – In our opinion PLH damage, although it may look bad, does not seriously affect either tree-growth or fruit-growth parameters. Shoot extension is not so important in bearing trees, and in fact, reduction of elongation or vigor may be desirable. A caveat to this philosophy however, is the potential role of PLH as vectors of fire blight. Because this disease has been prevalent this season, highly susceptible cultivars such as 'Gala' and 'Ginger Gold' etc., should be protected as much as possible from PLH feeding. This may be accomplished by frequent sprays as described above. ❖❖

UPCOMING PEST EVENTS

	43°F	50°F
Current DD accumulations (Geneva 1/1–7/10):	1656	1014
(Geneva 1999 1/1–710):	1778	1183
(Geneva "Normal" 1/1–710):	1616	1107
(Highland 1/1–7/10):	1912	1230

Coming Events:	**Ranges:**	
American plum borer 2nd flight begins	906–1876	973–1337
Dogwood borer peak catch	1551–1952	986–1306
Apple maggot 1st catch	1045–1671	629–1078
Apple maggot 1st oviposition	1566–2200	1001–1575
Obliquebanded leafroller 1st flight subsides	1420–2452	899–1790
Oriental fruit moth 2nd flight begins	1152–1819	772–1215
Peachtree borer peak flight	864–2241	506–1494
San Jose scale 2nd flight begins	1449–1975	893–1407

scaffolds
Dept. of Entomology
NYS Agricultural Exp. Sta.
Barton Laboratory
Geneva, NY 14456-0462

PEST FOCUS

Geneva: **Spotted tentiform leafminer** 2nd flight began 6/15. Degree days (base 43°F) since then = 636. **Obliquebanded leafroller** flight began 6/8. Degree days (base 43°F) since then = 799. Larval hatch 50% complete. **Codling moth** flight began 5/19; DD50 since then = 688. **Lesser appleworm** 2nd flight began this week.

Highland: **Codling moth** flight began 5/8; DD50 since then = 1238. **Obliquebanded leafroller** flight began 6/5. Degree days (base 43°F) since then = 884. **Spotted tentiform leafminer** 2nd flight began 6/12. DD43 since then = 725. **Leafhopper** numbers high, hopper burn apparent.

INSECT TRAP CATCHES (Number/Trap/Day)

Geneva, NY

	6/26	6/29	7/10
Redbanded leafroller	0.1*	0.5	0.6
Spotted tentiform leafminer	378	399	364
Oriental fruit moth	1.0	1.5	1.0
Lesser appleworm	1.3	1.0	3.5
Codling moth	5.3	13.7	5.5
San Jose scale	0	0.3	0
Pandemis leafroller	0.3	0.2	0
American plum borer	0.4	0.2	0.1
Lesser peachtree borer	3.0	5.5	5.5
Peachtree borer	0.1*	0.3	0.5
Obliquebanded leafroller	4.1	2.0	3.4
Apple maggot	0	0	0
Dogwood borer	0.1	0.3	0.6

Highland, NY

	7/3	7/10
Redbanded leafroller	0.9	0.6
Spotted tentiform leafminer	42.5	42.4
Oriental fruit moth	0.4	0.2
Codling moth	3.6	0.5
Pear psylla (eggs/leaf)	0.4	0
Pear psylla (nymphs/leaf)	0.4	0
Lesser peachtree borer	0.3	0.9
Lesser appleworm	0.4	0.1
Dogwood borer	0	0.1
American plum borer	0.1	0.7
Obliquebanded leafroller	0.6	0.6
Tufted apple budmoth	0	0.1
Variegated leafroller	–	0.2*

* 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.

DAVID COMBS
ENTOMOLOGY
BARTON LAB

NYSAES