scaffolds Update on Pest Management and Crop Development

FRUIT JOURNAL

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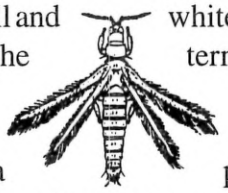
INSECTS

THREE IN A PEAR?

PEAR AFFAIRS
(Art Agnello, Entomology, Geneva)

Pear Thrips

❖❖ A minute insect that is in the trees for only a brief period during early spring can cause decreases in fruit set of pears and apples in the Northeastern U.S., including parts of New York. The pear thrips, *Taeniothrips inconsequens* (Uzel), is an unusual insect about 1/20 inch long, with fringed wings and asymetrical mouthparts. The adult pear thrips is slender and brown, with short antennae and a swelling behind the head; the wings are long and narrow, with fringes of long hairs. Young pear thrips are small and white with red eyes ("thrips" is the term used both for one or several of the insects.) Its mouthparts consist of a pair of stylets for puncturing plant tissue, plus a cone with a rasp-like surface, which is used for roughening the wound and then sucking up the juices.



Pear thrips originally came from Europe, but were introduced into California at the turn of the century, where they exhibited a taste for plums, cherry, apple, and pear; other favored hosts are basswood, birch, beech, ash, and sugar maples. It is the adult thrips that show up on host trees in great numbers and do the most extensive damage. Generally speaking, they arrive just before or during the opening of fruit buds (the period we appear to be stuck in right now). They enter the bud, or else start feeding on the bud tip and gradually work themselves in. Eggs are laid under the bud scales, petals and sepals, on stems and in other succulent flower and leaf parts. The larvae feed voraciously for about 3 weeks, adding to the damage already caused by the adults. After the larvae finish their feeding period (early June in N.Y.), they drop off the tree and enter the ground, often to depths of a foot or more, where they enter a diapause stage until fall. Sometime in September or October, they pupate in their earthen cell, and remain until the adults emerge the next April. Under natural conditions, the duration of a single adult's life probably covers a period of 4–6 weeks.

On fruit trees, feeding is usually concentrated on the tender flower parts, which gives the blossom buds a shriveled, scorched appearance, or may cause them to fall off completely. Leaf damage in hosts such as maples is caused by the insects' feeding on the developing leaf tissue; this results in leaves that are dwarfed, mottled yellow to green-brown, and distorted. Small scars resembling blisters show up along the leaf veins and stems. The tree will consequently have a thin crown, possibly suffer some moisture stress, and may even drop its leaves prematurely in the fall.

Because much of this pest's life is spent underground, control of damaging populations is very difficult. Insecticides have been suggested by some, but their effectiveness is difficult to measure, because most growers are not aware of the damage until after it has already been done, although thrips are sensitive to nearly any prebloom insecticides used in most commercial orchards. On fruit trees, an oil spray is advised against the egg-laying adults as they emerge, timed between the bud burst and green cluster

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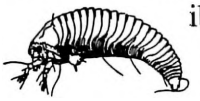
stages of pear and plum (right now). This can be a prudent treatment to apply in any case, as a preventive measure against other pests such as mites or pear psylla. Massachusetts guidelines suggest that it can be useful to examine fruit buds at this time to determine whether thrips are present.

Pear Rust Mite

This occasionally serious pest of fresh market pears gives a number of growers problems each year. Pear rust mite outbreaks may be worse in areas receiving extensive sprays of materials destructive to predators, and the development of miticide-resistant strains are suspected in some cases. Scouts and growers have difficulty detecting these pests until after they have already damaged the crop because of their minute size. The overwintering stage is a light brown, wedge-shaped adult, which is nearly invisible without a 15X hand lens; these mites settle in any protected area on the trees, such as behind leaf buds, especially on wood 1 or 2 years old.



The mites become active as tree growth starts in the spring, and feed upon the first green tissue at the bud base, later moving to the foliage or fruit. The summer forms are nearly white in color, and even smaller than the overwintered adults. The more tender foliage is preferred, so populations on leaves decrease as the leaves mature and toughen. Damaging populations sometimes develop on the fruit soon after petal fall, sheltered in the hairs around the calyx and remaining active for a few weeks, until sometime in mid-July when they appear to leave the fruit.

Mite feeding causes leaves to turn brown or bronze, which may stunt the growth of young trees; on older trees the damage to fruit is far more significant. Severe russetting of the fruit can leave the entire surface rough and brown, which alters or destroys the desirable varietal skin appearance. Early in the growing season, mite feeding at the calyx or stem ends gives a localized russetting to those areas. If mite growth is unchecked, this feeding and russetting may spread over the fruit entirely, depending on the population numbers and the length of their feeding period.

Monitoring guidelines tend to be complicated, but one rule of thumb is a 2–3% fruit infestation rate for fresh market pears; also, a spray should be applied if any pears contain 30 or more rust mites. If levels on individual fruits do not exceed 10 mites, there is generally a grace period of about 2 weeks within which a spray could be applied. A miticide such as Kelthane or Carzol should be used at petal fall if any of these thresholds are reached, but frankly, a preventive petal fall spray is probably the most advisable course of action in blocks with a history of rust mite infestations. Those growers electing to use Agri-Mek for pear psylla within the recommended 7–14-day post-petal fall time period will probably realize some added rust mite control from that spray. The effectiveness of summer sprays to control rust mite in N.Y. is questionable.

Pear Leaf Midge

This is a long-standing member of the insect community that had not been noticed for a number of years until recently. Pear leaf midge

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scaffolds

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

Editors: A. Agnello, D. Kain

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(*Dasyneura pyri*) is a gnat-like insect that has been responsible for increasing amounts of damage in Eastern New York pear orchards the past few years.

This insect occurs in Europe, the United Kingdom, New Zealand, and New Brunswick; however, its first reported U.S. occurrence was actually in the Hudson Valley in 1932. It has 3–4 generations per year, which are overlapping and variable in their timing. The adult is a dark brown fly, 1.5–2.0 mm in length; this small size, plus the fact that it lives for only 1–3 days, makes it difficult to observe in the orchard. The first generation adults begin to fly in late April, but this date can vary from mid-April to early May; the flight lasts until late May to early June. Eggs, which are reddish in color, are laid within the rolled margins of only undeveloped leaves, as soon as the leaves emerge from the bud. Several eggs, up to as many as 35, may be laid per leaf. The maggots (which are white to yellow-red in color) hatch out in 4–6 days and feed on the leaf surface for 10–12 days; this damage prevents the normal unrolling of the leaf. After the feeding period, some of the maggots drop to the soil and pupate close to the surface, while others pupate inside the rolled leaves. The entire life cycle takes 25–30 days, except that maggots of the last one or two generations of the season remain in the soil over the winter and pupate the following spring. The number of generations per year is probably determined by the length of the period during which there is new shoot growth in the summer.

Damage caused by pear leaf midge infestations can take a number of forms. This insect attacks only the foliage, which causes the edges of leaves to roll tightly upwards and inwards towards the midrib. Heavy infestations may cause shortening of extension shoots, an effect that is probably more important in nursery stock than in mature trees. During the early stages of an infestation, there is a slight, irregular puffiness or "lumpiness" to the rolled portion of the leaf, which may become reddened and brittle. Eventually the leaf curves downward like a sickle, and the red areas turn black; leaf drop may follow. Early in the season, infested leaves occur only at the tips of shoots. As the shoot extends, however, the young leaves at the tip may in turn be attacked by later generations, so that affected leaves may be found at several levels along the shoot.

We can give only generalized guidelines for the control of pear leaf midge because so little work has been done on it. Presumably, conventional management practices using insecticides usually control this insect, but economically damaging infestations have begun to occur because of either missed or poorly timed sprays, or because of an emerging pesticide tolerance in local populations. Successful control has been reported in New Hampshire using standard organophosphate compounds (azinphosmethyl or phosmet) to kill maggots rolled inside the leaves. In European orchards, diazinon also has been reported to be successful. In general, the best strategy appears to be spraying a known infestation in the late spring, after the first generation adults have laid eggs, but before pupation begins. Insecticide persistence is important; in problem orchards, 2–3 post-bloom applications are markedly better than 1–2. It may be necessary to examine the leaves regularly to determine the proper timing. To be practical, it is probably best to spray as soon as symptoms of an infestation are found (mid-May to early June).

Very little supplementary information is available about this pest. In New Zealand apple orchards, the use of the pyrethroid fenvalerate has been correlated with outbreaks of a closely related species (apple leaf midge). Bosc pears are slightly less susceptible than are Bartletts and Clapps. The prospects for natural control are uncertain, although two species of parasitic wasps have been recorded from the apple leaf midge. If insecticide resistance is the root cause of these infestations, and if they start to become more noticeable in commercial orchards, we may ultimately need to re-evaluate our pesticide use patterns in pears and begin looking for different approaches to this problem.❖❖

DISEASES

THE MUMMY'S CURSE

BROWN ROT CONTROL STRATEGIES
(Wayne Wilcox, Plant Pathology, Geneva)

❖❖ PERIODS OF HOST SUSCEPTIBILITY. Three important ones: (1) bloom; (2) the last 2-3 weeks before harvest; and (3) shuck split through pit hardening (important for all stone fruits EXCEPT sour cherries). This period is often overlooked by growers, advisors, and those who write fungicide labels, but it can be very important if weather is wet and inoculum is available.

INOCULUM AVAILABILITY. The three main sources of brown rot inoculum for BLOSSOM infections are (1) last year's mummified fruit within the orchard (most important); (2) cankers that developed when the brown rot fungus grew from rotten fruit into fruiting wood (most commonly a problem on peaches); and (3) abandoned orchards or wild stone fruit trees within 1/4 mile of the orchard. Obviously, the degree to which these sources are or are not present has a tremendous influence on the risk of blossom infection in any particular orchard or year. Also, remember that wet weather during the prebloom period encourages the production of brown rot spores from mummies and cankers, whereas dry weather significantly suppresses it.

The primary inoculum for FRUIT infections can come from mummies and cankers or the spores produced on infected blossoms. For peaches, thinned fruitlets lying on the orchard floor can also be a very important spore source during the preharvest period. Remember that fruitlets thinned before pit hardening decompose quickly and produce relatively few spores, whereas those thinned later decompose slowly and serve as a major source of inoculum just before harvest.

ENVIRONMENTAL REQUIREMENTS FOR INFECTION. The brown rot fungus requires rain or heavy dew for its spores to germinate and cause infection, and it thrives under relatively warm conditions (77°F is optimum). If inoculum is plentiful, infection can occur after only a few hours of wetness at optimum temperatures. However, as temperatures get lower and/or inoculum gets scarcer, progressively longer periods of wetness are required. The current "best guess" (based upon controlled-environment experiments) is that about 12–24 hr of wetness are required to produce infections of sour cherry blossom at 60°F under typical field conditions, and this figure should be adjusted down or up according to temperature and relative inoculum availability. Also, sweet cherry and apricot blossoms appear to be more susceptible than those of sour cherry.

One last factor determining blossom blight development is humidity following a possible infection period. Rains during bloom followed the next day by wind and low humidity are much less likely to cause blossom blight than rainy periods followed by still air and mugginess.

FUNGICIDE CONSIDERATIONS. There are three general fungicide categories for brown rot control: (1) Protectants (Captan, ferbam, Bravo, sulfur). These must be present before a wetting period occurs and need to be reapplied fairly regularly (depending on the material) if they are washed off by rain. (2) Dicarboximides

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(Rovral and Ronilan). Provide both protectant and limited systemic activity. They can stop blossom infections if applied within 24–48 hr after the start of an infection period and have some after-infection activity against fruit rot as well. Significantly, they also interfere with the production of brown rot spores from infected blossoms and fruit, so they are useful in slowing down the spread of an epidemic. For resistance management, limit use to either the bloom OR the preharvest period. Lots of restrictions on Ronilan. (3) Sterol inhibitors (Funginex, Indar, Nova, and Orbit). Forget Funginex and Nova—they're not even in the same league as Indar and Orbit, which are both excellent. No label for Orbit on cherries or "prunes" (although "plums" are OK). No label for Indar on prunes or plums.

BOTTOM LINE. Sanitation is important—orchards with plenty of mummies in the trees or lying on the ground will need more fungicides than those that have been cleaned up. If thinning peaches, do so before pit hardening. Determine the need for bloom sprays according to stone fruit species, the availability of inoculum, and weather. If you actually need a blossom spray, you probably need something more effective than sulfur; captan's decent under moderate pressure; the SI's and dicarboximides are most effective, and both provide kickback plus antisporulant activity.

After bloom, provide protection through pit hardening if weather is wet. Sulfur, captan, and Bravo are the only choices on all crops during this period (no Bravo after bloom on plums or after shuck split on other stone fruits); Benlate and Topsin can be used, but don't count on 'em unless you're primarily interested in black knot control. Indar is labeled during this period on cherries (for leaf spot) and peaches (for scab); too bad that whoever wrote the label didn't read up on brown rot biology and list this disease, too.

Minimize injuries and treat as necessary during the last few weeks before harvest, using disease pressure and fungicide characteristics to guide specific decisions.❖❖

MILDEW

APPLE POWDERY MILDEW
(Wayne Wilcox, Plant Pathology, Geneva)

❖❖ A quick reminder about our old friend, powdery mildew. Remember that primary infections have already overwintered within infected buds. Once these open and start sporulating (about tight cluster), they produce the inoculum that causes secondary infections at temps greater than 50°F. This is what we spray against.

Infected buds are less winterhardy than healthy ones, and most are killed at temperatures below 11°F. Thus, PM seldom overwinters to cause a problem in colder regions (e.g., Champlain Valley) or following unusually cold winters like 1993–94. Overwintering PM levels were probably reduced at sites that approached but didn't quite reach this temperature during the past winter. At such sites, you may want to keep an eye out to see when the first infected shoots arising from fruit buds appear (these are visible before infected shoots that arise from vegetative buds), since a significant reduction in inoculum could allow a delay in the start of PM control programs.

The rule of thumb is to start protectant programs (sulfur) once tight cluster and 50° temperatures are reached. SI programs can start about a week later (pink) because of the post-infection activity of these materials. Thus, if you're looking for a minimal SI program for both scab and mildew, concentrate on the period from pink through first cover.❖❖

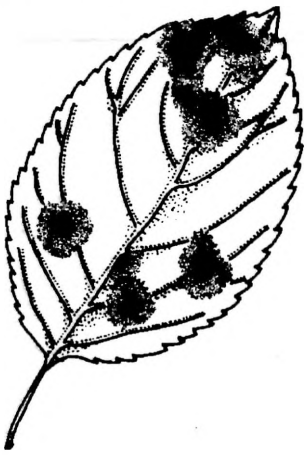
SCAB

APPLE SCAB UPDATE
(Dave Rosenberger,
Plant Pathology, Highland)

Apple scab ascospore maturity counts from eastern NY:

		Imm.	Mature	Empty	Tower shoot
4/23	Saratoga Co.	81%	19%	0%	210

❖❖ A light Mills period (13 hrs, 57 degrees, 0.28 inches rain in Highland) occurred April 26–27. Rain begain again early during the morning of April 29, and weather forcasts suggest an extended wetting period (>24 hrs) is likely. Apple trees are at the early pink bud stage. Major spore releases can be expected for apple scab. This is also the growth stage at which quince rust and cedar apple rust are most likely to cause fruit infections.❖❖



CORROSION PROTECTION

RUST DISEASES
(Dave Rosenberger,
Plant Pathology,
Highland)

❖❖ The two most common rust diseases on apples are cedar apple rust and quince rust. Cedar apple rust causes yellow or orange lesions on both leaves and fruit of susceptible apple cultivars. Quince rust infects apple fruit, but not leaves.

Apple fruit are most susceptible to rust infections during the period from tight cluster through bloom. The tissue that will develop into the apple fruit is exposed just below the blossom and can become infected with rust as soon as the cluster leaves fold back from the flower clusters. However, in most years rust spores are not abundant until apples reach pink or full bloom.

Wetting and temperature requirements for cedar apple rust infection are noted in the 1996 Pest Management Recommendations for Commercial Tree-Fruit Production. Wetting requirements for quince rust infection have not been clearly defined. However, I have only seen severe quince rust infections when extended wetting periods (at least 30 hours, usually >48 hrs) with moderate temperatures (50–75°F) have occurred between tight cluster and late bloom. Under these conditions, more than 50% of the fruit on unprotected trees can develop quince rust. More commonly, 5–15% of fruit are affected. Delicious, Golden Delicious, Rome, and Cortland appear to be the most susceptible cultivars for quince rust in the Hudson Valley, but quince rust can occur on nearly all cultivars.

Unlike apple scab, none of the apple rust diseases have a secondary infection cycle. Primary lesions on apple fruit or leaves will never result in secondary spread to other apple leaves. All of the inoculum must come from cedar apple rust galls or quince rust cankers on cedar trees. After this primary inoculum is exhausted (usually about June 15 in the lower Hudson Valley), no further infections on apple can occur until the following season.

Cultivars like Empire, McIntosh, and Liberty, which are considered resistant to cedar apple rust, can still suffer damage when exposed to very high levels of cedar apple rust inoculum. On these cultivars, leaves fail to develop typical yellow rust lesions. However, germinating rust spores damage

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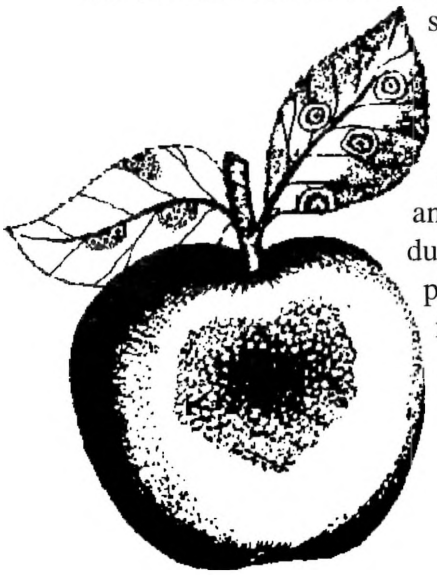
enough leaf cells to allow invasion of the leaves by other weak pathogens. The resulting leaf spots are virtually indistinguishable from frog-eye leafspot. With cultivars like Liberty that are resistant to apple scab, the best solution for avoiding rust-induced leaf spotting is to locate the apple plantings well away from cedar trees. For scab-susceptible cultivars like Empire and McIntosh, rust-induced leaf spotting can be prevented by using scab fungicides that also have activity against rust diseases.❖❖



PEST FOCUS

Geneva: **Spotted tentiform leafminer** 1st catch 4/25.
Highland: First **pear psylla** eggs on leaves (Bartlet). 1st **European red mite** egg hatch. 1st **rose leafhopper** on multiflora rose.

INSECT TRAP CATCHES (Number/Trap/Day)

Geneva NY

	4/22	4/25	4/29
Green fruitworm	1.0	0.3	0.3
Redbanded leafroller	0.1*	0	0.3
Spotted tentiform leafminer	0	1.7*	2.5

HVL, Highland NY

	4/15	4/22	4/29
Green fruitworm	0.2	0.2	0.2
Pear psylla (eggs/bud)	1.0	2.5	1.5
Redbanded leafroller	0.3	7.7	14.7
Spotted tentiform leafminer	0	4.3*	15.3
Oriental fruit moth	-	0.1*	0.3

*=1st catch

(Dick Straub, Peter Jentsch)

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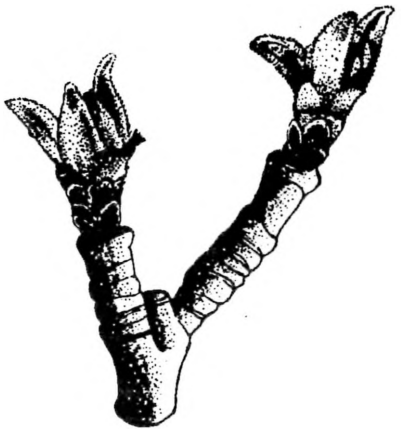
PHENOLOGIES

Geneva:
Apple (McIntosh) - half-inch green
Sweet cherry (Windsor) - bud burst
Tart cherry (Montmorency) - swollen bud
Pear - bud burst
Peach - swollen bud
Highland:
Apple (McIntosh)- pink
Pear(Bartlett) - white bud



UPCOMING PEST EVENTS

	43°F	50°F
Current DD accumulations (Geneva 1/1- 4/29):	158	68
(Highland 1/1- 4/29):	350	163

Coming Events:	**Ranges:**	
Green fruitworm peak flight	64-255	19-108
Pear psylla 1st egg hatch	111-402	55-208
Redbanded leafroller 1st flight peak	180-455	65-221
Spotted tentiform leafminer 1st flight peak	180-439	65-217
Green apple aphid present	127-297	54-156
Rosy apple aphid nymphs present	91-291	45-148
Pear thrips in pear buds	137-221	54-101
Obliquebanded leafroller larvae active	149-388	54-201
Oriental fruit moth 1st catch	129-587	44-338
McIntosh at tight cluster	188-279	68-138

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