scaffolds Update on Pest Management and Crop Development

FRUIT JOURNAL

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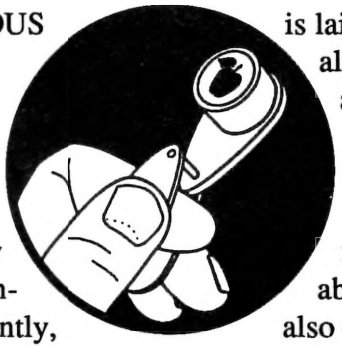
INSECTS

MULLEIN IT OVER

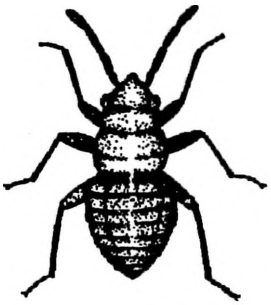
PHYTOPHAGOUS MIRID BUGS (Dave Kain, Entomology, Geneva)



❖❖ Damage to apples caused by phytophagous mirid bugs has increased in recent years. Until recently, most reports of fruit damage in our area came from research orchards at the New York State Agricultural Experiment Station (NYSAES), but increasing numbers of commercial orchards are starting to suffer damage; these bugs are already perennial pests in Canadian apple orchards, particularly in southern Ontario. What we refer to here as mirids is a complex composed of mullein plant bug (MPB), *Campylomma verbasci* (Meyer) and apple brown bug (ABB), *Atractotomus mali* (Meyer). In western New York, MPB is more prevalent than ABB. These bugs are actually considered beneficial part of the season, being predators of pest mites and aphids. However, from bloom (when overwintered eggs hatch) until shortly after petal fall they may severely damage fruit.

MPB eggs are laid in the fall, singly, under the bark behind leaf abcission scars on the current season's growth. Only the tip of the egg protrudes from the bark. Eggs are minute and flask-shaped. In central New York, an average of about 180 degree days (base 50°F from Jan. 1) are required for the overwintered eggs to begin hatching in the spring. This coincides with the pink to king bloom stage of Red Delicious. An additional 180 DD_{50F} are required for all of the eggs to hatch. Peak egg hatch occurs at full bloom, and hatch is essentially complete by petal fall. ABB also overwinters as an egg that is laid in mid-summer. Eggs are generally laid in groups, and are almost always laid on new spur wood. Eggs are minute and are also flask-shaped. The orange egg cap may be visible protruding from the bark behind leaf abcission scars. ABB egg hatch also occurs at bloom time.

MPB nymphs are small and lime-green in color. They might be confused with rosy apple aphid or white apple leafhopper nymphs (which appear in limb-tapping samples at about the same time), except that they move much more rapidly. They may have a reddish cast after feeding on European red mites. ABB nymphs are mahogany brown in color, are larger than MPB at the same sampling period, and the second antennal segment is enlarged. Both species pass through five instars, which takes about 4 weeks to complete.



MPB early nymph

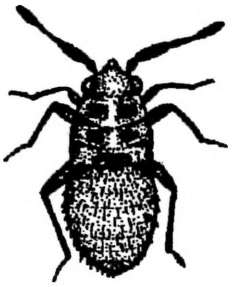


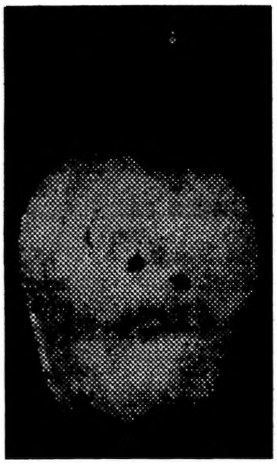
ABB early nymph

Adult MPB are small and green (teneral adults) or brown with black spines and spots on their legs. They do not damage the fruit, but are predaceous. They may be found in fruit trees beginning about late June. Some may remain in the trees through the rest of the season. Most,

continued...

however, migrate to mullein plants to lay eggs. In late summer or early fall, after another generation or two has been completed on mullein, the resultant adults will migrate back to fruit trees to lay overwintering eggs. ABB adults are slightly larger and are entirely dark, almost black, in color. Like the nymphs, the second antennal segment is prominent. Adults appear mid-summer, about 4 weeks after the nymphs. Female ABB lay eggs 1–2 weeks later.

Damage to developing flowers or young fruitlets is caused by 1st generation nymphs of both species. Nymphs puncture the epidermis, which results in raised, corky, brown or black wart-like blemishes on the fruit. Some fruits will drop. On dark-skinned varieties like Red Delicious, minor blemishes may become less noticeable, and even disappear, as the fruit ripens. However, severe blemishes and malformation of the fruit, and minor blemishes on lighter-skinned varieties, will make the fruit unmarketable as fresh fruit. Some varieties appear to be more susceptible than others, although any variety can be attacked. Red Delicious, Golden Delicious, Northern Spy and Spartan are reported to be among the more sensitive, while McIntosh seldom suffers damage. We have seen severe damage in Rome and Crispin as well.



Mirid bug presence can be determined by tapping limbs with a length of hose or a stick over a tray covered with black cloth. Monitoring should take place every 2–3 days beginning at pink and continuing through a week or so after petal fall. New growth, with a higher proportion of flower than leaf clusters, should be sampled by sharply tapping 2 or 3 times. It is suggested that 4 limbs on each of 10 trees (40 limbs total) be tapped in each separate orchard or block.

It is difficult to predict where and when mirid bugs may become a problem. Monitoring should begin in areas where damage was noted previously. Look also in areas that are in proximity to weedy areas inhabited by mullein or evening primrose. To determine whether mirids are present before trees begin to develop, last season's fruit wood may be excised in late winter and placed in water in a warm place, such as a greenhouse, to force eggs to hatch. Catching adult MPB in pheromone-baited traps in the fall may also be used to predict the presence of bugs the following spring. MPB pheromone lures are available commercially (PheroTech, etc.). Pheromone-baited wing traps with 1-inch spacers catch the bugs most effectively. It is not certain whether actual densities of the spring nymphs can be reliably predicted using either of these methods. However, they can be used to identify at-risk orchards that should be intensively monitored by limb-tapping in the spring.

Unfortunately, the damage these mirids cause may outweigh their value as predators, and they sometimes require control with insecticides. Timing of insecticide application is critical but difficult to ascertain. The fact that the peak hatch

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scaffolds

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period is during full bloom, when no insecticides may be applied in New York State, makes prevention of all damage unlikely. Researchers in Washington report that at least some fruit damage is the result of nymphs feeding on flower parts during bloom. Recent research in New York suggests that this is the case here, as well. Others have reported that young fruitlets are damaged directly. The time when damage occurs may determine when insecticides are most effective and what method of sampling is most appropriate. Studies were conducted in 1994 and 1995 at the NYSAES with a number of materials at different timings. There were no significant differences among treatments in either year, but all insecticides tested were significantly better than the check.

In 1995, insecticides were applied only at petal fall. Although all were better than the check, all but one treatment resulted in damage at harvest between 3.2% and 7.5%. From this, it was apparent that at least some of the damage was being done prior to petal fall, and that pink or pink+petal fall treatments may be more effective than petal fall treatments alone. This may be especially true in years when mirid egg hatch begins early and/or the bloom period is prolonged, or when pest numbers are high. An insecticide with relatively long residual activity, such as Asana, applied at pink, may provide control through the bloom period. Pink applications should be made as late in that growth stage as is safe for honey bees. At a certain density, petal fall applications of other materials may be just as good at preventing damage and are less harmful to predatory mites. Petal fall insecticide applications will kill most of the nymphs present, but some of the damage has already been done. Petal fall sprays should be applied as soon as possible after blossoms are off.

Reliable treatment thresholds have not yet been developed for these pests in New York State. In Ontario, using the limb-tapping method of sampling starting at petal fall, a threshold of 5–7 nymphs/25 tapped limbs is used to determine the need for petal fall sprays. Results from recent studies in New York suggest that a petal fall application alone will not prevent unacceptable damage if this threshold is exceeded.

Over the last three seasons we've been working on several aspects of mirid ecology and control including phenology of overwintered egg hatch, insecticide selection and timing, the timing of damage to apple fruit, sampling, and thresholds here at the NYSAES. We'll report on results of this research in a later Scaffolds.❖❖

HOW MUCH?!

ERRATUM

❖❖ If Only It Were True Dept: Last week's article on pear psylla control without Agri-Mek contained a *slight* error in the discussion of Mitac. The rate stated in the article (3 oz/Acre) would make this one of the cheapest psylla programs going if it were correct. The sentence should have read: Results from our research trails have shown that two applications (total of 3 lb a.i./Acre), as needed, usually maintain populations below damaging levels.❖❖

DISEASES

OUT IN THE FIELD

APPLE SCAB FUNGICIDE RESISTANCE—WHERE DO WE STAND?

W. Wilcox and W. Köller

❖❖ There is a lot of talk, with some misunderstanding and confusion, regarding the status of scab resistance to both the SI fungicides and dodine. These concerns are valid, but they need to be kept in the proper perspective. SI fungicides are still valuable components of apple disease management programs, and we have no evidence of resistance-induced disease control failures anywhere in New York. The purpose of our research and publicity on this topic is to keep the preceeding statement true for as long as possible! We're not trying to scare people away from using these fungicides, but do want to emphasize that they must be used sensibly in order to maintain their viability and avoid unpleasant surprises.

Dodine also can be a valuable component of scab control programs. Resistance-induced control failures have occurred, but the fungicide continues to perform well in many locations when used carefully. Following is a summary of our recent research and current thinking regarding the status of resistance to both materials.

SI RESISTANCE. Remember that "resistance" to these fungicides refers to a matter of degree. Individual isolates of the scab fungus run the whole gamut of sensitivity, ranging from highly sensitive to much more insensitive or resistant (but never immune). In our experiments, recommended rates of Rubigan (3 fl oz/100 gal) or Nova (1.5 oz/100 gal) still provided about 50% control (relative to the unsprayed checks) when trees were heavily inoculated with a resistant isolate. Such isolates make up <2% of a wild population, but slowly build up in sprayed orchards. In two well-documented orchards in Nova Scotia and Michigan, scab control problems became obvious after resistant isolates built up to comprise 40% of the pathogen population.

With this in mind, in 1995 we looked at the resistance status of three perennial "problem" orchards in WNY. Resistance levels were 15 to 20%, which had us concerned. So, in 1996 we looked at six additional WNY orchards that were chosen by different consultants as being fairly typical, rather than atypical problems. We determined what the sensitivities to Rubigan, Nova, and dodine were before spraying started, then followed the control performance of Rubigan or Nova in each orchard when the fungicide was tank-mixed with mancozeb (half of each block) or Syllit (the other half of each block) throughout the primary scab season.

The results were very encouraging. Resistance levels ran from 2 to 4% in four of the orchards (typical of a baseline or wild type population) to one orchard with a 14% level, where control was excellent. Good to excellent scab control was obtained in five orchards. In the sixth, where control was poor, we tested 50 of the scab lesions that did develop, and were surprised to see that the percentage of resistant isolates was the same as on unsprayed trees. Conclusion: these isolates didn't cause disease because they were resistant to the SI spray; rather, they seem to have escaped the spray altogether. It's easy to blame resistance when SI sprays don't work, but there can be plenty of other causes.

DODINE RESISTANCE. Dodine resistance levels in these same orchards ran from 4% to 24%. Performance of the SI-dodine mixture was equal to that of the SI-mancozeb mixture in four of the orchards and was superior to the SI-mancozeb mixture in the other two (1996 was a good year for burnout materials).

Dodine resistance does not appear to be a universal phenomenon, even in WNY where the fungicide was very popular in its heyday. Nevertheless, commercially-damaging levels of resistance do occur around the state. For instance, an orchard in the Champlain Valley was absolutely plastered with scab last year after relying

continued...

solely on dodine in the early season, and nearly all of the lesions that we examined were caused by resistant isolates. So, it can and does happen.

THE TAKE-HOME MESSAGES. Dodine resistance probably isn't as widespread as once assumed, but it can cause serious losses when present. The best precautions are (i) know the history of the orchard and don't rely on Syllit where previous dodine problems have occurred, or where it was used intensively for a number of years in the past; (ii) don't rely on more than one or two sprays of Syllit alone (at the beginning of the season), even where previous use has been limited; (iii) if using Syllit as a burn-out material, tank-mix with an SI or a protectant fungicide to counteract the high inoculum present. As noted above, the SI + Syllit tank-mix combination was very effective last year.

A few basic considerations for SI's:

• Scab populations are becoming less sensitive to the SI's than they were 10 years ago. This doesn't mean that SI's don't work anymore; in fact, they do. It does mean that some of the previous "margin for error" is going or gone. See next statement.

• The SI's are very rate-dependent for their performance. Low rates on susceptible tissues, either intentional or otherwise (e.g., poor spray coverage, including that provided to parts of the "off" row in alternate-row systems), means trouble: poor control and a buildup of resistant isolates.

• Maintaining good SI rates on susceptible tissues reduces the percentage of scab isolates that might be resistant to the SI. Tank-mixing with a protectant fungicide or dodine reduces the number of scab isolates that will live to see the SI in the first place. Both techniques are recommended for providing good disease control and minimizing the danger of resistance in the future.❖❖

FIELD NOTES

HUDSON VALLEY

APPLE SCAB UPDATE

(Dave Rosenberger, Plant Pathology, Highland)

Apple scab ascospore counts for leaves collected —

Date	Imm.	Mature	Dis-ch'g'd	Tower dischg	DD_{32} since Gtip
4/14[1]	83%	17%	0%	3	—
4/15[2]	98%	2%	0%	0	—
4/15[3]	71%	28%	1%	392	98
4/21[4]	71%	27%	2%	918	140

[1]Saratoga Co.
[2]Clinton Co. (Peru)
[3]Ulster Co. (Highland)
[4]Ulster Co. (Highland)

Scab infection periods in Highland:

April 12–13 22 hrs wetting, 48 °F, 0.48 inches rain
April 17–19

❖❖ In the lower Hudson Valley, the scab season is now in full swing. Spore development moved very slowly during the past week because of the cold weather, but the number of spores discharging in our tower discharge test continued to increase. Comparison of the spore count data from April 15 and April 21 shows that relatively few spores discharged during the long, cold infection period of April 17–19. Nevertheless, the April 17–19 infection period, with trees at early-tight cluster, could have resulted in significant infections in orchards with carry-over inoculum.

Based on the spore count done on April 14, we can assume that ascospores will be ready to go in Saratoga Co as soon as trees develop green tissue. (They were still dormant as of April 21). In Peru, the spores were still very

immature and no significant discharge is likely for at least another week.

Rust Diseases:

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. Hawthorne rust is less common and can infect apple leaves but not fruit. Hawthorne rust can cause typical rust lesions leaves of cultivars such as McIntosh, Empire, and Liberty that are generally considered resistant to cedar rust.

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 on page 43 in the 1997 Pest Management Recommendations for Commercial Tree-Fruit Production. Wetting requirements for quince rust infection have not been clearly defined. However, severe quince rust infections usually occur only following 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 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 Hudson Valley), no further infections on apple can occur until the following season.

Cultivars vary considerably in their susceptibility to cedar apple rust. Golden Delicious, Rome Beauty, Jonathan, Lodi, Idared, and Mutsu are some of the common older cultivars that are very susceptible. Newer cultivars to add to this list include Fuji, Graeburn, Gala, Cameo, Ginger Gold, Goldrush, and Arlet. Honeycrisp is only moderately susceptible to cedar apple rust. McIntosh and Delicious are considered very resistant.❖❖

PEST FOCUS

Geneva: Adult **tarnished plant bug** observed on tart cherry buds. 1st **redbanded leafroller** and **spotted tentiform leafminer** trap catches.

PHENOLOGIES

Geneva:
Apple(Mac) - half-inch green
Pear, Tart and Sweet cherry - early bud burst
Plum - swollen bud
Peach - quarter inch green
Highland:
Apple (Mac) - tight cluster
Pear (Bartlett) - late bud burst

UPCOMING PEST EVENTS

	43°F	50°F
Current DD accumulations (Geneva 1/1- 4/21):	141	57
(Highland 1/1-4/21):	223	88

Coming Events:	**Ranges:**	
Green fruitworm flight peak	64-255	19-108
Redbanded leafroller 1st flight peak	180-455	65-221
Pear psylla 1st nymphs	111-402	55-208
Green apple aphid present	127-297	54-156
European red mite egg hatch begins	157-358	74-208
OBLR overwintered larvae active	149-388	54-201
Rosy apple aphid nymphs present	91-291	45-148
Pear thrips in pear buds	137-221	54-101
STLM 1st oviposition	141-319	48-154
Oriental fuit moth 1st catch	129-587	44-338
Rose leafhopper-1st nymph on multiflora rose	188-402	68-208
McIntosh at tight cluster	188-279	68-138

INSECT TRAP CATCHES (Number/Trap/Day)

Geneva NY

	4/14	4/17	4/21
Green fruitworm	0	0	0
Redbanded leafroller	0	0	0.4*
Spotted tentiform leafminer	0	0	0.4*
Lesser appleworm	-	0	0
Oriental fruit moth (apple)	-	0	0
Oriental fruit moth (peach)	-	0	0

HVL, Highland NY

	4/14	4/21
Green fruitworm	0.4	0
Redbanded Leafroller	2.4	8.6
Pear psylla (eggs/bud)	3.1	3.1
Spotted tentiform leafminer	0.8	11.9
Oriental fruit moth	0	0

* 1st catch

(Dick Straub, Peter Jentsch)

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.

scaffolds
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