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Update on Pest Management and Crop Development

FRUIT JOURNAL

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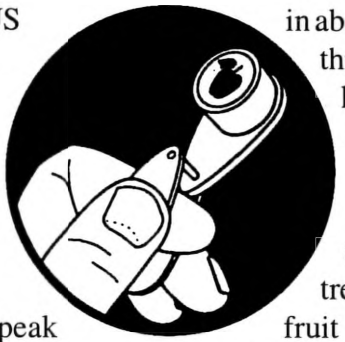
INSECTS

THE WORMS CRAWL IN

NO FLIES ON US
(Harvey Reissig, Entomology, Geneva)



❖❖ We're in the traditional 'peak activity' window for apple maggot right now, and although catches haven't been particularly stunning yet, this primer on maggot control strategies might bear repeating at this time:

The apple maggot (AM), *Rhagoletis pomonella* (Walsh), is a native insect that originally infested hawthorn trees throughout the northeastern United States and Canada. The AM has been a major pest of apples since they were introduced into North America. In unsprayed habitats, it is not uncommon for nearly 100% of apple and hawthorn fruit to be infested by AM, because natural enemies do not reduce population levels of this pest in natural settings. Therefore, some type of control program will continue to be necessary to keep this pest at acceptable levels in commercial apple plantings for the foreseeable future.

Biology

The AM overwinters as pupae in soil beneath apple trees. Adults emerge from the ground in late June or early July (first 2000 catch in Geneva was 6/29, right on schedule) and begin to lay eggs in the fruit after a 7–10 day pre-oviposition period. Adults remain active during July and August, and a few adults remain active throughout September and even in October in seasons when the weather is mild. AM females lay eggs underneath the skin of apples. These eggs hatch in about a week and larvae begin to tunnel throughout the fruit. Usually, particularly in cultivars with very hard fruit, larvae grow very slowly while the apple remains on the tree. Larvae usually complete their development after apples have dropped from the tree in the fall. Then they leave the fruit and tunnel into the soil to pupate, where they spend the winter.

General Management Principles

Organophosphate insecticides are very effective in controlling AM adults, and it is very rare to find detectable levels of AM injury in fruit sampled in commercial apple orchards in New York State. Therefore, management programs for AM are based on the assumption that there are no indigenous populations of this pest inside orchards and are designed to prevent flies from immigrating into orchards from outside habitats. Unfortunately, in NY there are usually numerous hosts (abandoned or uncultivated apple and hawthorn trees) that are chronically heavily infested

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with AM and relatively close to commercial orchards. Apple maggot flies are capable of moving at least several hundred yards to infest other hosts and at least a few flies will always move longer distances of up to one mile.

Extensive research has been done to compare the biology and host preferences of AM reared from apple fruit and various species of hawthorn fruit. Populations living in these two different hosts are considered to be somewhat distinct and are called "host races". There is considerable disagreement among various authorities about whether or not flies infesting hawthorns will immigrate into commercial apple orchards and oviposit in apples. For all practical purposes, heavily infested hawthorn trees near apple orchards should be considered just as much a potential threat as heavily infested wild apple trees.

Elimination of Wild Hosts and Cultivar Differences

Since wild hosts (apples and hawthorns) in close proximity to commercial orchards are considered to be the only sources of potential infestations of AM flies, it is a sensible strategy to eliminate as many of these pest sources as possible. Obviously, it is desirable to create as large a "host-free" area around orchards as possible, but most authorities recommend removing alternate hosts for a distance of at least 100 m from the borders of commercial orchards. It is best to survey wooded areas surrounding apple orchards in the early spring when apples are in bloom because they are easier to detect at this time.

AM prefer to oviposit in certain cultivars of apples, and larvae survive better in some varieties of fruit than others. Early ripening, soft cultivars such as 'Wealthy', 'Cortland' and 'Early McIntosh' are generally more favored for AM oviposition and larval survival than harder, later-ripening cultivars such as 'Rome', 'Delicious', and 'Idared'. 'Northern Spy', which is a cultivar with hard, late-ripening fruit, appears to be one exception to this general rule because it is reported to be a favorite cultivar for AM infestation. Although no commercially produced cultivars are immune to AM infestation, management strategies can be relaxed somewhat in less preferred, harder varieties.

Conventional Protective Control of Apple Maggot Flies

This program does not require monitoring of specific orchard blocks. Whenever it is determined that AM flies have first emerged in an unsprayed habitat (preferably in close proximity to the targeted orchard) the entire orchard should be sprayed initially with an organophosphate insecticide 7–10 days (their pre-oviposition period) later. Additional sprays should be applied at 10–14-day intervals until about the middle of August. Since flies emerge in late June-early July in New York State, this protective program will usually require about 4 sprays annually. Usually, this type of program is only necessary in blocks in which detectable levels of AM-infested fruit have been found, or in orchards located adjacent to extensive numbers of heavily infested wild hosts.

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Reduced Protective Spray Schedule for AM Control

This program also does not require monitoring of specific orchard blocks and is very similar to the conventional program, except that the first spray is applied on a calendar basis on July 15. Then, two more sprays will be applied, on August 1 and August 15. The delay of the first spray for AM control is based on the principle that extensive monitoring studies conducted in NY have shown that flies usually do not begin to immigrate into commercial apple orchards from wild habitats until about the middle of July. This type of program usually is quite effective unless environmental conditions result in a shortage of fruit on wild hosts outside of orchards. Then, AM flies may alter their usual behavior of initially ovipositing in fruit on wild host trees close to their emergence site and may immediately begin to disperse to find suitable oviposition hosts in commercial apple orchards.

Conventional AM Monitoring Program

This program is described in detail in the Apple IPM Scouting Manual (IPM Pub. No. 207, "Apple IPM: A guide for sampling and managing major apple pests in New York State"; also at: http://www.nysipm.cornell.edu/publications/apple.man/mid.html) and is based on the idea that it is not necessary to spray an orchard unless a certain population level of flies (monitored by red sticky spheres) is detected immigrating into a monitored block. This technique has been used quite successfully by many growers in NY in "typical" orchards, and the average orchard monitored by this strategy will usually require 1–2 sprays annually for control of AM. Although many growers in NY use apple maggot traps hung along the edges of commercial orchards as a general indication of when to start spraying for AM, most do not adhere strictly to the formal recommendations described for the monitoring program. Some of the most common deviations from the protocol are: (1) Many growers use apple maggot traps only to determine when the first AM spray should be applied and then spray at 14-day intervals thereafter, regardless of subsequent trap catches. (2) Growers often monitor for apple maggots in one or two blocks and then spray the remainder of their orchards based on trap catches in the monitored blocks. (3) Many growers simply apply sprays whenever any flies are captured and ignore the recommended threshold level of 5 flies/trap.

Growers and consultants using an AM monitoring program often are concerned about late season catches of flies on traps during September and October in commercial apple orchards. Studies conducted in NY have not shown that there is any need to apply control sprays after the middle of August, even though flies can still be captured on traps after the estimated period of residual effectiveness of the last spray. Apparently, female AM active late in the season in apple orchards do not oviposit in fruit, even though most of them have completely developed eggs in their ovaries.

This monitoring program should not be used in "high risk" blocks that are adjacent to extensive sources of AM infestations from wild hosts. Using this program in such blocks will not only result in a potential risk of low levels of AM injury, but will also not result in any reduction of pesticide use because experience has shown that in such blocks the traps will simply indicate that a spray is needed every 10–14 days throughout the season after the traps are deployed.

Although there have never been any formal recommendations presented on exactly how many AM traps should be deployed to completely monitor a grower's entire acreage of apples, it should be noted that AM traps, in contrast to pheromone traps for moths, have a very short range of attraction (10–25 yards). Therefore, it is clearly unreasonable to expect that trap catches in any one particular block can be used to monitor fly immigration into another orchard 1–2 miles away! Also, there is some margin of safety built into the monitoring recommendations. The monitoring directions assume that the protective residue from an organophosphate spray will last 10–14 days before another spray is needed.

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Obviously, residues from organophosphate sprays gradually degrade and become less effective, so that the residual effectiveness in killing flies does not decline abruptly on the 14th day after a spray to become completely ineffective.

AM Monitoring, Border Spray Program

This strategy is similar to the standard recommended monitoring program, except that whenever trap catches indicate a need for an AM control spray, only the 3–4 border rows of the monitored block and the ends of rows are sprayed. This program is based on the principles that there are no indigenous populations of AM flies inside monitored orchards, and that AM flies immigrating into orchards from outside sources will be killed by residues on treated border rows trees before they can move into the interior of the orchard.

Although some growers and consultants have reported excellent success using border sprays for AM control, very little research has been done in NY to formally test the effectiveness of this type of program. Therefore, growers should be cautious in using this strategy. This program should probably be used only in "low risk" blocks that are not near sources of potential outside AM infestations and are planted to cultivars which are not favored for AM oviposition or larval survival.

New Insecticides and Tactics for AM Control

Organophosphate insecticides offer many advantages to growers for AM control. They are very effective, relatively inexpensive, generally not toxic to predaceous mites, provide good residual control, and there is no evidence to suggest that flies are becoming resistant to these compounds. However, changing pesticide regulations are resulting in either the loss of registration of some of these compounds or changes in the re-entry or pre-harvest intervals, which may adversely affect using these materials, particularly for late season control of AM.

Recent laboratory and field tests have shown that newer "reduced risk" compounds, such as SpinTor and Provado, have activity against the AM. When these materials were tested in NY, they provided comparable control to a standard treatment of Guthion, but weekly sprays were necessary for SpinTor because of its short residual effectiveness. These materials, particularly Provado, have very little contact activity and must be ingested by the flies to be effective. Laboratory trials have shown that the effectiveness of Provado against AM can be increased by adding sugar as a feeding stimulant, but these same effects have not been demonstrated in the field. Currently, cooperative work is being conducted with Dr. Dan Moreno, a USDA fruit fly specialist in Weslaco, TX, to develop an improved feeding stimulant bait that can be mixed with these types of new insecticides to increase their effectiveness. Additional trials of other new materials are being tested in the laboratory and field against AM, including: photoactive dyes, Calypso, Avaunt, and (outside of NY) poison baited spheres.

Kaolin clay (Surround) has also shown some potential for use against AM, although the NY data are not as strong as those reported by some researchers in other regions. In single-tree applications during the 2000 season at Geneva, 0% of the fruit were infested at harvest, although damage in the unsprayed checks was only 1%. In a commercial organic orchard that received airblast applications of Surround (on a less-than-optimal schedule), there was no difference in infestation from the 3% in untreated trees. It seems clear that application frequency and rate are key factors in the efficacy of Surround for this purpose.❖❖

ERRATUM

KEEPING UP

ERRATUM

❖❖ In the article, 'Phytophthora Root and Crown Rot', printed in Volume 10, No. 18, Ridomil Gold EC should replace Ridomil EC as the recommended fungicide for this disease. Ridomil Gold is the new formulation of Ridomil.❖❖

PEST FOCUS

Geneva:

American plum borer 2nd flight beginning. **Codling moth** 2nd flight underway.

Codling moth model is at 1128 DD_{50}. (2nd spray date at 1260–1370 DD_{50}) **Spotted tentiform leafminer** 2nd flight began 6/14. DD_{43} accumulated since then = 1236. (Resample at 1150 DD_{43} or greater; see Cornell Recommends pg. 64)

Highland:

Apple maggot rebounding to above threshold levels after first application.

Codling moth model is at 1355 DD_{50}. which is within the degree day range for timing of a 2nd spray. **Spotted tentiform leafminer** 2nd flight began 6/11. DD_{43} accumulated since then = 1385. (Resample at 1150 DD_{43} or greater; see Cornell Recommends pg. 64)

INSECT TRAP CATCHES (Number/Trap/Day)

Geneva, NY

	7/23	7/26	7/30
Redbanded leafroller	0.3	2.5	0.6
Spotted tentiform leafminer	200	165	46
Oriental fruit moth	4.3	4.3	3.1
Lesser appleworm	5.1	4.8	10.9
Codling moth	1.3	2.8	5.3
San Jose scale	11.5*	18.7	15.6
American plum borer	0.2	1.7*	2.3
Lesser peachtree borer	3.4	4.0	1.8
Peachtree borer	0.9	1.5	2.3
Dogwood borer	0	0	0
Obliquebanded leafroller	0	0	0.1
Apple maggot	0.7	0.4	0.2

Highland, NY

	7/23	7/30
Redbanded leafroller	2.1	1.7
Spotted tentiform leafminer	48.6	28.9
Oriental fruit moth	0.4	0.4
Codling moth	0.9	2.4
Lesser appleworm	1.0	0.7
Variegated leafroller	0.1	0
Obliquebanded leafroller	0.2	1.0
Tufted apple bud moth	0	0
Apple Maggot	0.5	0.9
Dogwood borer	0	0
Sparganothis fruitworm	0	0

Hudson, NY (Steve McKay)	7/23	7/30
American plum borer	0	0.6
Oriental fruit moth	0	0

* first catch

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UPCOMING PEST EVENTS

	43°F	50°F
Current DD accumulations (Geneva 1/1–7/30):	2169	1461
(Geneva 1/1-7/30/2000):	2146	1364
(Geneva 1/1–7/30 "Normal"):	2159	1507
(Highland 1/1–7/30):	2455	1699
(Hudson 1/1–7/30):	2268	1534

Coming Events:	**Ranges:**	
Apple maggot oviposition punctures present	1566–2200	1001–1575
American plum borer 2nd flight peak	1648–2688	1037–1840
Codling moth 2nd flight peak	1471–3103	931–2212
Comstock mealybug 1st flight subsides	1668–2245	1101–1450
Comstock mealybug 2nd gen. crawlers emerging	2106–2768	1447–1924
Obliquebanded leafroller 2nd flight begins	2124–3040	1412–2076
Oriental fruit moth 2nd flight subsides	1806–2783	1164–1963
Redbanded leafroller 2nd flight subsides	1927–3045	1291–2160
San Jose scale 2nd flight peak	1934–2591	1271–1874
Spotted tentiform leafminer 2nd flight subsides	1773–2514	1148–1818

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