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FRUIT JOURNAL
Update on Pest Management and Crop Development

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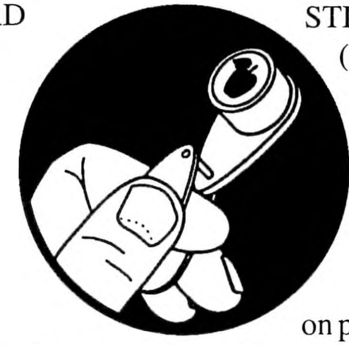
INSECTS

ORCHARD RADAR DIGEST

ORCHARD RADAR DIGEST



Geneva Predictions:

Codling Moth

CM development as of August 5: 2nd generation adult emergence at 69% and 2nd generation egg hatch at 30%. Key management dates: 2nd generation 3% CM egg hatch: July 30 (= first spray date where two sprays needed to control 2nd generation codling moth, 2nd spray is 2-3 weeks later). 2nd generation 30% CM egg hatch: August 08 (= single spray date where one spray needed to control 2nd generation codling moth).

Spotted Tentiform Leafminer

Optimum third sample date for 2nd generation STLM sapfeeding mines: August 03.

White Apple Leafhopper

2nd generation WAL found on apple foliage: August 05.

Highland Predictions:

Codling Moth

CM development as of August 5: 2nd generation adult emergence at 85% and 2nd generation egg hatch at 53%. Key management dates: 2nd generation 30% CM egg hatch: August 01, Thursday (= single spray date where one spray needed to control 2nd generation codling moth).

THEY SUCK

STINKIN' BUGS

(Dick Straub and Peter Jentsch, Entomology, Highland)

❖❖ Reports of stink bug feeding on pear at this time serve to remind us that this incidental pest can inflict a rather serious amount of cosmetic damage to pear and apple. Particularly, during the past few seasons, a number of Hudson Valley growers have experienced disturbing amounts of injury at harvest, which we have subsequently attributed to stink bugs. Because such damage is often associated with hot, dry weather conditions, such as we have wittnessed this summer, it seems timely to present a review of what is presently known about this pest.

A number of pentatomid species reside in New York, but two are most prevalent: the brown stink bug, *Euschistus servus* (Say) and the green stink bug, *Acrosternum hilare* (Say).

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Both cause similar damage and are synchronous in occurrence. Hence, we collectively refer to them as 'stink bugs'. Curiousity about the common name can be satisfied by squashing one between the thumb and forefinger!

As far as we know, only adults cause late season damage. Adults are shield- shaped and rather large (1/2" in length). Color is obviously brown or green, depending on the species. They survive and reproduce on numerous forage and vegetable crops, but the primary alternate hosts in New York are weed plants such as mustard, dock, mallow, mullein, vetch and plantain. Common hosts of green stinkbug also include seed pod plants such as elderberry, black locust, honey locust, and mimosa. Although stink bugs will oviposit on apple and pear foliage, offspring cannot complete development on these incidental hosts. Of primary concern are adults, generally driven from weed hosts during late summer dry periods, which move into orchards and feed on mature or nearly mature pome fruits. During drought seasons, adults move into orchards during July and may remain until harvest of the latest cultivars.

Because stink bugs tend to immigrate from adjacent woodlands or uncultivated areas, damage is usually concentrated at orchard borders. Adults move from tree to tree and may damage multiple fruits as they probe via their piercing-sucking mouthparts. Damage appears as circular sunken spots on the fruit surface...it may remind one of a moonscape. Upon shallow peeling, the damage appears corky in nature. Damage differs from bitter pit in that it tends to be concentrated toward the stem end of the fruit, and the corky cells are not as dark.

Because they are easily disturbed, stink bugs are not always easily seen and therefore, monitoring can be a time-consuming process. Monitoring for late-season pest severity or potential can be accomplished by examination of fruit for either damage or for insect presence. Moving cautiously, examine fruit on a number of trees for 1/2 hour; yield of 1–3 adults on fruit or 1 damaged fruit/100 fruits indicates a moderate population; no treatment is necessary, but monitor again in 3–5 days. If similar examinations yield >3 adults on fruit or >1 damaged fruit/100 fruit, a treatable population is indicated. Some cultivars (because of color, maturity, volatiles, ??) appear to be more attractive to stink bugs, so a range of cultivars should be sampled.

Control of stink bugs is made difficult by the fact that all materials have limited residual effectiveness (i.e., individuals must be directly contacted with the spray). Lack of residual usually requires somewhat regular re-treatment to impact new immigrants. The organophosphate and carbamate classes of insecticides tend to be ineffective against stink bugs, and hence, the late-season chemical options are limited. Growers are cautioned to note the preharvest intervals:

Endosulfan (Thiodan; Thionex) [PHI: apple 21d; pear 7d]

Danitol [PHI: apple 14d; pear 14d]

Asana [PHI: apple 21d; pear 28d]

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NATURAL PESTICIDES

EVERYTHING OLD IS NEW AGAIN
(Dave Kain & Art Agnello, Entomology, Geneva)

❖❖ Naturally occuring pesticides that are derived from plants or plant parts are commonly referred to as "botanicals". Botanicals have been around for quite a while. Along with arsenicals and other inorganic pesticides, they were pretty commonly used before the advent of the synthetic, organic pesticides rendered them "obsolete". From time to time they're re-examined for various reasons and may be familiar. Botanicals are of interest to those concerned with pest management for a variety of reasons. They are generally less toxic to the applicator than many synthetic pesticides. They may be acceptable in the organic market where synthetic pesticides are not. Because, in general, they break down quickly, they may also be of use near harvest, when control is needed but other materials may not be applied because of PHI restrictions. Rapid degradation also means they are less likely to become environmental problems. Botanicals, however, are not without concerns. They are usually broad spectrum poisons that can be hard on beneficial insects. And, unlike "biological" pesticides like B.t.'s, insect growth regulators and pheromones, they are somewhat acutely toxic to humans and other mammals. The fact that they break down rapidly in the environment, while an advantage in some respects, also means that sprays need to be:

- timed precisely to coincide with pest events,
- applied at lower thresholds and, possibly,
- applied more often.

They are also expensive.

This regular annual article used to state that the four most common botanicals available for use in fruit crops today were rotenone, pyrethrin, sabadilla and ryania. Unfortunately, for those who found them useful, ryania and sabadilla are no longer on the list due to voluntary cancellation of their registrations. To round out the article, we'll substitute information on a few, newer, natural materials that, while not technically botanicals, kind of fit the category. Information on these products appears in the 2002 Tree-Fruit Recommendations (pp. 38-42).

ROTENONE Rotenone is derived from the root of various plants of the *Derris* or *Lonchocarpus* species from Southeast Asia, Central and South America. It is available as at least 118 formulated products from a large number of manufacturers. It is synergized by the addition of piperonyl butoxide (PBO), which is another botanical material. Rotenone is expensive compared with synthetic insecticides, but is moderately priced for a botanical. It is the most commonly mentioned of the botanicals in pre-synthetic literature and is at least somewhat effective against a large number of insect pests. These include: pear psylla, strawberry leafroller, European corn borer, European apple sawfly, cherry fruit fly, apple maggot, cranberry fruitworm, raspberry fruitworm, pea aphid (which is similar to rosy apple aphid), European red mite and two-spotted spider mite, codling moth, plum curculio, Japanese beetle and tarnished plant bug. Unfortunately, it is also toxic to ladybird beetles and predatory mites. But, it is non-toxic to syrphid flies that feed on aphids, and to honeybees. Rotenone is rapidly degraded by sunlight, lasting a week or less.

Of the botanicals mentioned here, rotenone is the most toxic to humans and other mammals. The acute oral LD50 is from 60- 1500 mg/kg. In small doses it may be irritating or numbing to mucous membranes. It is highly toxic to fish, having been commonly used as a fish poison. It is also toxic to birds and pigs.

PYTRETHRIN (Pyrethrum) This compound is produced in the flowers of *Chrysanthemum cinerariaefolium* and is the forerunner of the synthetic pyrethroid insecticides. There are not nearly as many commercially available formulations of this chemical as there are for rotenone, but it is available as an emulsifiable concentrate, in combination with rotenone, or alone as a wettable powder,

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from at least a couple of sources. Pyrethrin is the least expensive of these four materials. Depending on the rate used, it may be less expensive than many synthetic insecticides. It is also synergized by PBO. Pyrethrin is labelled against a large number of pests. An addendum to the label for one formulation of pyrethrin showed it to be moderately to highly effective (61- 100% control) against the following pests of fruit: grape leafhopper, potato leafhopper, leaf curl plum aphid, blueberry flea beetle, blueberry thrips and blueberry sawfly. It is also effective against cranberry fruitworm. It is quickly broken down in the environment and may be used up to and including the day of harvest.

Pyrethrin is relatively non-toxic to humans and other mammals, although the dust produces allergy attacks in people who are allergic to ragweed pollen. The acute oral LD50 is 1200- 1500 mg/kg. It is toxic to fish, but "relatively" non-toxic to honey bees.

AZADIRACHTIN (Neem) Azadirachtin is derived from the seeds of the neem tree, *Azadirachta indica*, which is widely distributed throughout Asia and Africa. The observation that the desert locust did not eat the leaves of the neem tree, and another, closely related species, led to the isolation and identification of azadirachtin in 1967. Since then, azadirachtin has been shown to have repellent, antifeedent, and/or growth regulating insecticidal activity against a large number of insect species and some mites. It has also been reported to act as a repellent to nematodes. Neem extracts have also been used in medicines, soap, toothpaste and cosmetics.

The most common commercial formulations of neem available for N.Y. tree fruit is Neemix (W. R. Grace & Co.), which lists leafminers, mealybugs, aphids, fruit flies, caterpillars and psylla, and Align (AgriDyne), which includes some minor leafrollers on the label. Azadirachtin has shown good activity against spotted tentiform leafminer in tests in past years, but the formulation that was available at that time was somewhat phytotoxic. In Dick Straub's insecticide trials in 1992 with another azadirachtin product called Margosan-O, the insecticide showed good activity against STLM and leafhopper. Margosan-O is no longer available for fruit crops. In laboratory tests by Jan Nyrop's lab, toxicity to the predatory mite Amblyseius fallacis was very low. Field trials against OBLR by Harvey Reissig in 1998 were not encouraging.

Azadirachtin is relatively short-lived and mammalian toxicity is low (rat oral LD50 >10,000). It can be used up to and including the day of harvest and reentry is permitted without protective clothing after the spray has dried. It is toxic to fish and aquatic invertebrates.

PIPERONYL BUTOXIDE (PBO) PBO is a synergist (in this case, a material that when added to a pesticide increases the activity of its active ingredient) of both rotenone and pyrethrin. It is also a botanical product, being derived from Brazilian sassafras. Acutely, it is very safe, having an acute oral LD50 of greater than 7,500 mg/kg, but it may be chronically toxic in high doses.

GARLIC (Guardian) A 10% formulation of garlic is registered on apples and a number of apple pests are on the label. In 1995, Guardian (supplied by THUMBS-UP Sales Co., Chesterland, OH) was applied in six sprays at two-week intervals, starting at petal fall, and compared with a 3-spray Imidan program. Following the manufacturer's recommendations, each application of Guardian included an adjuvant of Sylgard 309 and Tri-Fol, a buffering agent, to maintain an optimum pH below 5.5- 6.0. Results showed that the garlic spray applied at a rate of 11 oz/A did not provide control of any of the labelled apple arthropod pests in N.Y. and did not affect the population density of two predator species commonly found in apples. The foliar pests - aphids, leafminers and mites - were unaffected by the garlic sprays. The fruit pests - plum curculio, tarnished plant bug, obliquebanded leafroller and internal lepidopterans - were also not affected by the bi-weekly sprays. However, the garlic did not have any effect on the population density of the predators *T. pyri* or *Aphidoletes aphidimyza*.

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Although not technically botanical insecticides, the following materials are unique, natural products that kind of fit the category:

ABAMECTIN (Agri-Mek) is a natural fermentation product containing a macrocyclic glycoside, used on aplles and pears as as an acaricide/insecticide. When used as currently recommended, it controls Europeand red mite and pear psylla, and aids in the control of spotted tentiform leafminer. Abamectin is toxic to bees and predator mites on contact, but the foliar residue dissipates quickly, making it essentially non-toxic to these species after a few hours (low bee-poisoning hazard).

INSECTICIDAL SOAPS (M-Pede) are concentrates made from biodegradable fatty acids and are contact insecticides that can be effective against such soft-bodied arthropods as aphidds, mealybugs, and psyllids. They can provide suppression of pear psylla when used in a seasonal spray program, but the residual period is short. Uniform drying conditions are required to prevent droplet residues on the fruit surface. They have a low bee-poisoning hazard.

SPINOSAD (SpinTor) is a mixture of spinosyn A and spinosyn D molecules, a naturally derived group of toxicants from a species of Actinomyces bacteria which are found inhabiting soil. Spinosad, which acts as both a contact and a stomach poison, is available for use in apples, primarily against obliquebanded leafroller, although activity against spotted tentiform leafminer is also exhibited. SpinTor is essentially non-toxic to birds, fish, aquatic invertebrates, and most beneficials. It has a low bee-poisoning hazard.

KAOLIN (Surround) is a naturally occurring clay mineral that has many uses as a direct and indirect food, in food contact items, cosmetics and toiletries, and as an inert ingredient in many pesticide formulations. When applied, the 95 WP crop protectant forms a white, mineral-based particle film intended to reduce the damage to plants caused by certain arthropod and disease pests, as well as environmental stress caused by solar effects. In research trials in apples, it has shown some preventative efficacy against plum curculio, internal Lepidoptera such as codling moth and oriental fruit moth, leafrollers, phytophagous mites, leafhoppers, and apple maggot. In pears, it can additionally suppress pear psylla, and in stone fruits it reduces feeding damage from Japanese beetle. Frequent applications (7–10-day intervals) and maximal coverage are advised in New York while there is active foliar growth. Surround has a low bee-poisoning hazard. ❖❖

PEST FOCUS

Geneva: **Spotted tentiform leafminer** 2nd flight began 6/24. DD (Base 43°F) since then = 1299 (Resample sap-feeding mines, if necessary @ 1150 DD_{43}).

Highland: **White apple leafhopper** 2nd generation nymphs on apple. **Stink bugs** moving into apple.

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UPCOMING PEST EVENTS

	43°F	50°F
Current DD accumulations (Geneva 1/1–8/5):	2448	1689
(Geneva 1/1-8/5/2001):	2351	1601
(Geneva "Normal"):	2283	1591
(Highland 1/1–8/5):	2899	2037

Coming Events:	Ranges:	
Apple maggot flight peak	2033–2843	1387–1953
American plum borer 2nd flight peak	1648–2688	1037–1840
Codling moth 2nd flight peak	1471–3103	931–2212
San Jose scale 2nd flight peak	1934–2591	1271–1874
Spotted tentiform leafminer 3rd flight peak	2383–3142	1626–2231
Comstock mealybug 2nd gen. crawlers emerge	2106–2768	1447–1924
Comstock mealybug 2nd gen. crawlers peak	2350–2649	1642–1736
Obliquebanded leafroller 2nd flight begins	2124–3040	1412–2076
Obliquebanded leafroller 2nd flight peak	2482–3267	1616–2231
Redbanded leafroller 3rd flight begins	2389–3113	1722–2209
Oriental fruit moth 3rd flight begins	2172–2956	1448–2013

INSECT TRAP CATCHES (Number/Trap/Day)

Geneva, NY

	7/29	8/1	8/5
Redbanded leafroller	0.3	0.5	0.6
Spotted tentiform leafminer	33.5	183	442
Oriental fruit moth	1.8	0.8	2.9
Lesser appleworm	3.0	1.2	3.5
Codling moth	1.0	1.0	0.5
San Jose scale	14.0	32.0	20.8
American plum borer	2.1	1.7	1.6
Lesser peachtree borer	0.3	1.7	0.9
Peachtree borer	1.3	1.0	0.9
Dogwood borer	0.0	0.0	0.0
Obliquebanded leafroller	0.3	0.2	0.4
Apple maggot	0.0	0.2	0.1

Highland, NY

	7/29	8/5
Redbanded leafroller	0.8	0.9
Spotted tentiform leafminer	57.4	35.6
Oriental fruit moth	0.9	0.9
Codling moth	3.3	2.9
Lesser appleworm	2.4	0.6
Tufted apple budmoth	0.0	0.0
Variegated leafroller	0.5	0.6
Obliquebanded leafroller	0.6	0.6
Apple maggot	0.4	0.1
Sparganothis fruitworm	0.3	0.3
Fruittree leafroller	0.0	0.0
Dogwood borer	0.6	0.6

* 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.

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