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Update on Pest Management and Crop Development
F R U I T J O U R N A L

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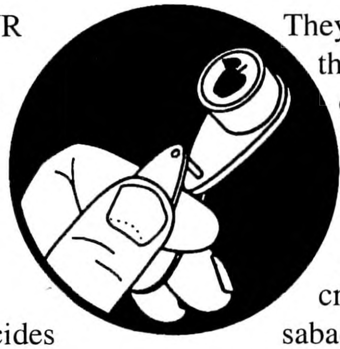
INSECTS

FORBIDDIN' FRUIT

GROW YOUR OWN

(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 generally more expensive than conventional synthetic pesticides on a per-use basis.

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, sabadilla and ryania are no longer on the list due to voluntary cancellation of their registrations by their formulators. 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 2001 Tree-Fruit Recommendations (pp. 34-36).

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 pipero-

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nyl 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, Pyrenone) 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, from at least a couple of sources. Pyrethrin is relatively inexpensive. 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, Neemix, Align, Aza-Direct) 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

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of neem available for N.Y. tree fruit are Neemix (W. R. Grace & Co.), which lists leafminers, mealybugs, aphids, fruit flies, caterpillars and psylla; Align (AgriDyne), which includes some minor leafrollers on the label; and Aza-Direct (Gowan), which lists pests such as weevils, leafhoppers, aphids, leafrollers, and mites. 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 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, but in a weekly program on single-tree plots in 2000, it significantly reduced damage from leafminers, tarnished plant bug and internal Lepidoptera (codling moth, oriental fruit moth, and lesser appleworm) from the untreated checks.

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 biweekly sprays. However, the garlic did not have any effect on the population density of the predators *T. pyri* or *Aphidoletes aphidimyza*.

Although not technically botanical insecticides, the following materials are unique, natural products that tend to be associated with this category:

ABAMECTIN (Agri-Mek) is a natural fermentation product containing a macrocyclic glycoside, used on apples 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 aphids, 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.

KAOLIN (Surround) is a naturally occurring clay mineral that has many uses as a direct and indirect food additive, in food contact items, cosmetics and toiletries, and as an inert ingredient in many pesticide formulations. When applied, the 95WP crop protectant forms a white, mineral-based particle film intended to reduce the damage to plants caused

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by certain arthropod and disease pests, as well as environmental stress caused by solar effects. In research trials in apples, it has shown preventive 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 are advised in New York while there is active foliar growth. Surround has a low bee-poisioning 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 that are found inhabiting soil. Spinosad, which acts as both a contact and a stomach poison, is available for use in apples and stone fruits, 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.

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PREEMINENT INSECTS

THINGS THAT CRAWL AND BORE
(Art Agnello & Dick Straub Entomology, Geneva & Highland)

❖❖ The first **Comstock mealybug** adult males of the season emerged just before the start of the July 4th weekend in our Wayne Co. pheromone traps, the invasive crawlers just started showing up in our limb tape traps last Friday (8/3). For those with a history of infestations of this pest in their pears (or peaches), the crawlers are the most susceptible stage for chemical control, and generally make their appearance about this time in western N.Y. every year. If you don't have out sticky-tape traps on the scaffold branches, check green shoots and cut a few pears to see whether any are showing up in the calyx. An application of Provado is recommended for this pest, and it is also on the Diazinon pear label. Refer to the Comstock Mealybug IPM Fact Sheet, No. 22, for photos and more information on its biology.

Larvae of both species of **peachtree borers** are still able to hatch and get into your stone fruit trees, and this week is timely for any orchard on a seasonal control program of trunk sprays: cherries - Asana, Lorsban, Ambush, or Pounce; peaches - add Thiodan to the above list (do not spray fruit).

European corn borer attack on young trees can occur from June through August and into September. Damage to the fruit usually shows up in late summer, when the August flight of the bivoltine strain is active. Bearing orchards are more likely to show some early corn borer damage on the fruit if growers relax their spray program in June or early July. However, most fruit feeding occurs between the last cover spray (mid-August) and harvest. According to research done by Dick Straub and Rick Weires, weedy sites provide plenty of alternative hosts for this insect. However, unusually hot and dry conditions affect normally preferred weed hosts in or around orchards (pigweed, pokeweed, smartweed and lambsquarter, in particular). Adults either do not lay eggs on those hosts, or larvae exit drought-stressed weeds and emigrate to apple; orchards near woodlands may be most affected.

Even though OP's are not particularly hot against ECB, regular cover sprays probably suppress them a great deal during early season. Furthermore, the standard 3-spray program for apple maggot obviously does not cover the major 2nd brood ECB (strain Z) flight period, which can extend until mid-September in our area. Applying additional sprays to contact this portion of the population is an option in high-problem orchards, although this is beyond the time when most growers have put away their sprayers for the season, and PHI's of candidate materials would have to be kept in mind. A pyrethroid would be the first choice for efficacy and residual (Asana 21 days; Danitol 14 days). Imidan has a 7-day PHI, but its efficacy would not be as high. In the final analysis, if a grower were truly concerned about PHI, a B.t. would probably work reasonably well. In any event, application should be made before the caterpillars become concealed in the plant tissue. Potential problem plantings should be checked periodically in August for shoot infestations of this caterpillar, which is cream colored with a dark head.❖❖

PEST FOCUS

Geneva:

Comstock mealybug crawlers caught in tape traps in Wayne Co. 8/3.

Codling moth model is at 1293 DD_{50}. (2nd spray date at 1260–1370 DD_{50}) **Spotted tentiform leafminer** 2nd flight began 6/14. DD_{43} accumulated since then = 1449. (Resample at 1150 DD_{43} or greater; see Cornell Recommends pg. 64)

Highland:

Apple maggot damage observed.

Spotted tentiform leafminer 2nd flight began 6/11. DD_{43} accumulated since then = 1612. (Resample at 1150 DD_{43} or greater; see Cornell Recommends pg. 64)

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UPCOMING PEST EVENTS

	43°F	50°F
Current DD accumulations (Geneva 1/1–8/6):	2383	1626
(Geneva 1/1-8/6/2000):	2337	1507
(Geneva 1/1–8/6 "Normal"):	2338	1644
(Highland 1/1–8/6):	2682	1877
(Hudson 1/1–8/6):	2473	1690

Coming Events:	**Ranges:**	
Apple maggot flight peak	2033–2843	1387–1953
Codling moth 2nd flight peak	1471–3103	931–2212
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
Redbanded leafroller 3rd flight begins	2389–3113	1722–2209
San Jose scale 2nd flight peak	1934–2591	1271–1874
Spotted tentiform leafminer 2nd flight subsides	1773–2514	1148–1818
Spotted tentiform leafminer 3rd flight begins	2215–2783	1537–2123

INSECT TRAP CATCHES (Number/Trap/Day)

Geneva, NY

	7/30	8/2	8/6
Redbanded leafroller	0.6	1.2	0.3
Spotted tentiform leafminer	46	166	217
Oriental fruit moth	3.1	0.5	2.4
Lesser appleworm	10.9	4.0	3.4
Codling moth	5.3	16.8	7.1
San Jose scale	15.6	29.3	12.8
American plum borer	2.3	2.3	1.4
Lesser peachtree borer	1.8	6.5	3.1
Peachtree borer	2.3	4.2	1.6
Dogwood borer	0	0	0
Obliquebanded leafroller	0.1	0.2	0.3
Apple maggot	0.2	0.7	0.6

Highland, NY

	7/30	8/6
Redbanded leafroller	1.7	2.4
Spotted tentiform leafminer	28.9	39.0
Oriental fruit moth	0.4	0.2
Codling moth	2.4	1.4
Lesser appleworm	0.7	1.3
Variegated leafroller	0	0.5
Obliquebanded leafroller	1.0	1.2
Tufted apple bud moth	0	0.1
Apple Maggot	0.9	0.4
Dogwood borer	0	0.6
Sparganothis fruitworm	0	0

Hudson, NY (Steve McKay)	7/30	8/6
American plum borer	0.6	0.1
Oriental fruit moth	0	0

* first catch

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