scaffolds Update on Pest Management and Crop Development

FRUIT JOURNAL

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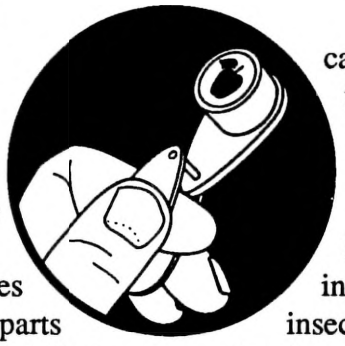
INSECTS

BUG BANE

NATURAL BORN KILLERS

(Dave Kain, Entomology, Geneva & Joe Kovach, IPM, 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 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 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 very expensive.

The four most common botanicals available for use in fruit crops today are rotenone, pyrethrin, sabadilla and ryania. Information on these products appears in the 1997 Tree-Fruit Recommendations (pp. 20–21). A relatively newer, and increasingly more common botanical insecticide that is receiving a lot of attention these days is azadirachtin (or neem).

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.

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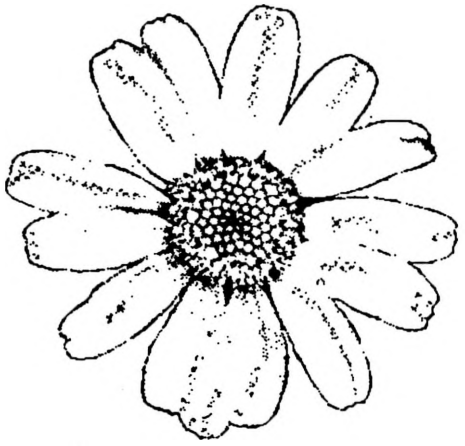
Of the botanicals mentioned here, rotenone is the most toxic to humans and other mammals. The acute oral LD50 is from 60–1500 mg/kg. In small doses it may be irritating or numbing to mucous membranes. It is highly toxic to fish, having been commonly used as a fish poison. It is also toxic to birds and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

A recent regulatory development illustrates the tenuous situation of many minor-use materials and basically makes the preceding discussion of rotenone academic. According to Mr. Joe Conti of the Rotenone Task Force, AgrEvo Environmental Services [(201) 307-3366] the Rotenone Task Force has deleted all agricultural uses from rotenone labels because of the cost of reregistration; these uses include all tree fruits and small fruits.

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, 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.

SABADILLA The source of sabadilla is the seed of a tropical lily. There are very few commercial formulations of this material. It is available as a dust that may also be added to water and sprayed, but clogging of the nozzles has been noted. It is moderately priced for a botanical (similar to rotenone). It will control potato leafhopper and is somewhat effective against tarnished plant bug. It has little effect on predators/parasitoids, except for the predatory

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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@nysaes.cornell.edu

Editors: A. Agnello, D. Kain

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mite *Typholdromus pyri*, to which it was extremely toxic in tests by Joe Kovach. Sabadilla may be used up to 24 hours before harvest. Apple is the only deciduous tree fruit crop specifically mentioned on the label of the one product we found registered for N.Y. use. Information provided by different sources has been ambiguous about sabadilla's effect on honeybees. Some say that it is relatively non-toxic to honeybees, and others (including the manufacturer) say it is toxic. The confusion may lie in the fact that sabadilla is toxic to honeybees on contact, but without any residual activity. In the interest of playing it safe (especially given the current state of bee health), it would probably be best to consider sabadilla a hazard to honeybees and to follow all necessary precautions to prevent their exposure to the material.

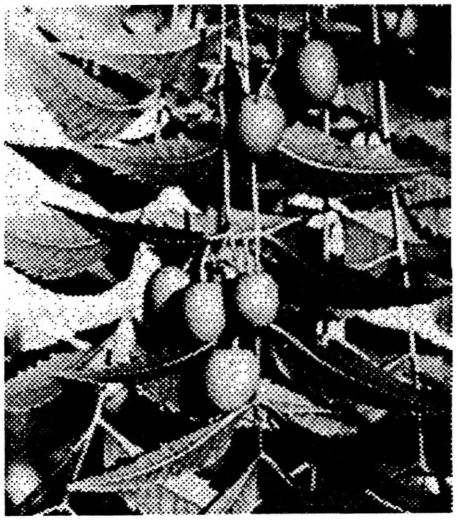
Sabadilla is less toxic to mammals than rotenone or pyrethrin; the acute oral LD50 is greater than 4000 mg/kg.

RYANIA A product of the roots and stems of *Ryania speciosa* of Trinidad, ryania acts as both a stomach and contact poison on target insects. It is the most expensive of the materials covered in this article, and is not as readily available as rotenone or pyrethrin. Ryanodine, the active ingredient, is formulated as a wettable powder and is labelled for use against the codling moth in apples. It is also toxic to the European corn borer and may control cranberry fruitworm. In Joe Kovach's tests it provided excellent control of a pest complex comprising codling moth, oriental fruit moth and lesser appleworm. It also controlled aphids, white apple leafhopper and spotted tentiform leafminer. It is more persistent than rotenone or pyrethrin and is more selective. It is generally not very harmful to pest predators and parasites, but is somewhat toxic to the predators *Atractotomus mali* and *Diaphnocoris* spp. It may also be used up to 24 hours before harvest.

The acute oral LD50 of ryania is 750–1200 mg/kg, less toxic than rotenone and slightly more toxic than pyrethrin. It is also toxic to fish.

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.



Recent field trials against OBLR by Harvey Reissig have not been encouraging.

Azadirachtin is relatively short-lived and mammalian toxicity is low (rat oral LD50 >10,000). It

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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 mite populations — 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*. ❖❖

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MODEL CITIZEN

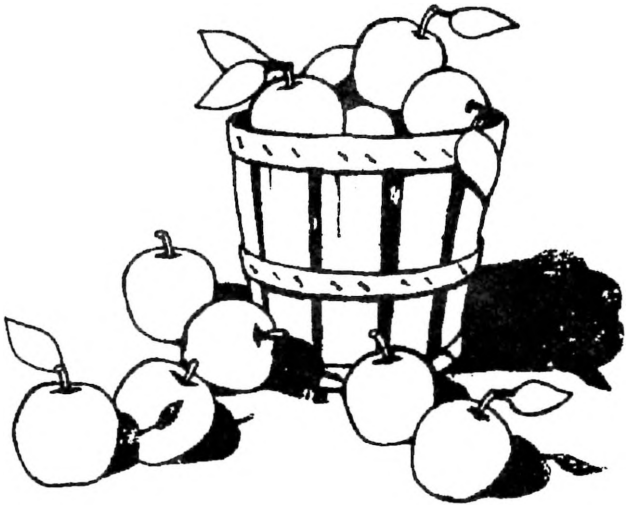
CODLING MOTH MODEL

❖❖ The model for 2nd generation codling moth larvae predicts that a control spray should be applied in problem orchards 1260 DD (base 50°F) after the start of the FIRST flight (5/27 in Geneva, 5/19 in the Hudson Valley). As of today, 8/4, 1220 DD have accumulated in Geneva and 1543 at Highland, which means that any needed sprays should be applied in the next few days in western N.Y. and should have already begun in the Hudson Valley. Keep your eye on the thermometer so that you will be timely with any OP applications you should decide to make. ❖❖

PEST FOCUS

Geneva: Spotted tentiform leafminer 2nd flight began 6/23. DD_{43} = 1148.

Highland: Apple maggot numbers are high. **Spotted tentiform leafminer** numbers are high east of the Hudson River. **Rose leafhopper** adults are beginning to return to rose after laying 3rd generation eggs on apple.



UPCOMING PEST EVENTS

	43°F	50°F
Current DD accumulations (Geneva 1/1- 8/4):	2124	1412
(Highland 1/1-8/4):	2588	1780

Coming Events:	Ranges:	
Apple maggot flight peaks	2033–2688	1387–1804
Comstock mealybug 2nd gen. crawlers	2106–2768	1447–1924
OBLR 2nd flight begins	2199–3040	1490–2076
Oriental fruit moth 3rd flight begins	2172–2956	1553–2013
Peachtree borer flight subsides	2230–3255	1497–2309
Redbanded leafroller 3rd flight begins	2389–3113	1722–2209
STLM 3rd flight begins	2215–2783	1558–2123
San Jose scale 2nd flight peaks	2136–2591	1479–1874

INSECT TRAP CATCHES (Number/Trap/Day)

Geneva NY

	7/28	7/31	8/4
Redbanded leafroller	0.7	0.3	0.1
Spotted tentiform leafminer	665	183	45
Lesser appleworm	0.5	0.7	0.3
Oriental fruit moth (apple)	2.3	0.5	0.5
Oriental fruit moth (peach)	0	0	0
San Jose scale	23.2	5.8	15.4
Codling moth	2.3	1.3	0.6
American plum borer	1.7	4.0	2.4
Lesser peachtree borer	0.7	0.5	0.8
Peachtree borer	7.7	5.7	4.0
Pandemis leafroller	0	0	0
Obliquebanded leafroller	0	0	0.3
Apple maggot	0.3	0.08	0.2

HVL, Highland NY

	7/28	8/4
Redbanded Leafroller	2.4	0.7
Spotted tentiform leafminer	28.4	43.5
Oriental fruit moth	0.6	1.2
Lesser appleworm	1.2	1.9
Codling moth	1.0	0.1
Fruittree Leafroller	0	0
Tufted Apple Budmoth	0.4	0.1
Obliquebanded Leafroller	0.1	0.2
Sparganothis Fruitworm	0.3	0
Variegated leafroller	0.2	0.3
Apple maggot	1.1	0.9

* 1st catch

(Dick Straub, Peter Jentsch)

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