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Update on Pest Management and Crop Development
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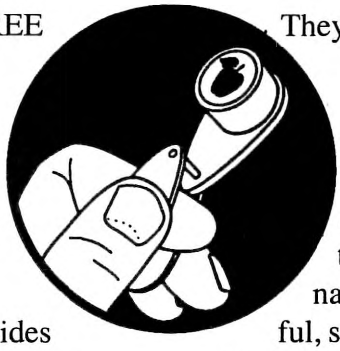
POISON POSIES

FROM THE TREE TO THEE

(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 very 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, sabadilla and ryania 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 1999 Tree-Fruit Recommendations (pp. 20–21).

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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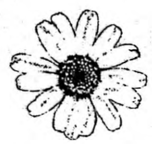

nyl butoxide (PBO), which is another botanical material. Rotenone is expensive compared with synthetic insecticides, but is moderately priced for a botanical. It is the most commonly mentioned of the botanicals in pre-synthetic literature and is at least somewhat effective against a large number of insect 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) 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.

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.

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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 last year 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 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*.

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

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.

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2-SPOTS BEFORE MY EYES

SUMMER CONTROL OF TWO-SPOTTED SPIDER MITES

R. W. Straub & P. J. Jentsch, Entomology, Highland)

❖❖ Without doubt, this has been an abnormally dry and hot season in the lower Hudson Valley and in parts of the Champlain Valley. Such conditions have predictably favored numerous outbreaks of two-spotted spider mite – not only on apple, but also on pear and many vegetables as well. This particular mite tends to show up later in the season than does European red mite; therefore, early-season miticide treatments targeted for ERM may be essentially spent by the time conditions favoring TSSM occur. We are fortunate to have obtained the Pyramite registration for mid-season rescue, but its weakness against TSSM is common knowledge; therefore, its utility in many orchards at this time may be limited.

Because data on alternatives against TSSM are scarce, we set up a replicated trial in the Hudson Valley Lab research orchard to evaluate single applications of prospective treatments. This block of mature Pioneer 'McIntosh' on M.9 rootstock had

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been uniformly treated with Apollo at petal fall. As shown by the following table, pre-treatment counts on 6/23 were variable, but TSSM populations were generally well above threshold.

Reduction of mid-season two-spotted spider mite on M.9/'McIntosh', Hudson Valley Lab, 1999

Treatment	Rate/100 gal	Pretreat. popn (motiles/ leaf)	% reduction 7d post appn*	% reduction 14d post appn*
TD 2383	6.4 oz	12.0	98.5	91.3
Agri-Mek	5.0 oz	13.0	80.5	88.4
Vydate**	32 oz	4.2	34.2	71.9
Pyramite	3.3 oz	15.0	66.1	38.5
Carzol	8.0 oz	4.6	0.0	0.0
Carzol + oil	4.0 oz + 2%	2.9	47.1	0.0

*Data corrected for untreated mortality by Abbott's formula.
**High rate labeled for aphids.

These results may provide some guidance regarding the management of TSSM. The experimental miticide TD2383 (cyhexatin) was indeed impressive, but it offers no help for the immediate future. Agri-Mek is rumored to have some degree of contact activity against motiles, and was surprisingly effective at reducing a high population of TSSM. Vydate is not typically considered to be a miticide, but the fact that mites are on the label, plus anecdotal evidence from fieldmen, prompted us to give it a look. In this trial, it provided very good kill of TSSM, suggesting that it may be a good choice in rescue situations – particularly if leafminers or leafhoppers are in evidence. Although the mediocre performance of Pyramite against TSSM was expected, the apparent ineffectiveness of Carzol was disappointing, given that it has traditionally been employed in emergency rescue situations.

We have heard through the grapevine that Vendex is effective against TSSM, but because of space restrictions, we were unable to test this candidate. So too, because of space limitations, materials were purposely tested at the maximum recommended rate only. It is probable that Agri-Mek will provide efficacy at the lower 2.5 oz rate, and the expense could be minimized. Good news is that Vydate is 'relatively' inexpensive; bad news is that Vydate is detrimental to predaceous mites – particularly at this high rate. Presently, however, many Hudson Valley orchards are being hammered by TSSM and the acuteness is much amplified by drought conditions. This is one of those legendary years in which growers may be forced to make the tough choice.❖❖

INSECT TRAP CATCHES (Number/Trap/Day)

Geneva, NY

	7/19	7/22	7/26
Spotted tentiform leafminer	64.4	3.3	7.1
Redbanded leafroller	0	0.2	0.1
Oriental fruit moth	12.8	8.2	7.6
Lesser appleworm	5.6	5.2	10.5
Codling moth	7.6	3.8	7.4
American plum borer	3.0	1.7	1.4
Lesser peachtree borer	0.6	0.5	1.1
Obliquebanded leafroller	0	0	0
Peachtree borer	2.5	1.3	2.8
Dogwood borer	0.6	0.5	0.3
Apple maggot	0.3	0.3	0.4

Highland, NY

	7/19	7/26
Spotted tentiform leafminer	20.0	4.9
Redbanded leafroller	0.5	0.3
Oriental fruit moth	0	0
Codling moth	3.9	4.8
Lesser appleworm	0	0.2
European red mite (#/leaf)	0.1	0
Two-spotted spider mite (#/leaf)	2.4	8.4
San Jose scale	0	-
Fruittree leafroller	0	0
Obliquebanded leafroller	0	0.4*
Tufted apple budmoth	0	0.1
Variegated leafroller	0.3	0.8
Sparganothis fruitworm	0.5	0.1
Apple maggot	0	0

* first catch

UPCOMING PEST EVENTS

	43°F	50°F
Current DD accumulations (Geneva 1/1–7/26):	2251	1544
(Geneva 1998 1/1–7/26):	2317	1560
(Geneva "Normal" 1/1–7/26):	2011	1439
(Highland 1/1–7/26):	2621	1837

Coming Events:	Ranges:	
American plum borer 2nd flight peak	1648–2612	1037–1840
Redbanded leafroller 2nd flight subsides	1927–3045	1291–2160
Apple maggot flight peak	2033–2688	1387–1804
STLM 3rd flight begins	2215–2783	1537–2123
Obliquebanded leafroller 2nd flight begins	2124–3040	1412–2076
Oriental fruit moth 2nd flight subsides	1806–2783	1164–1963
Oriental fruit moth 3rd flight begins	2172–2956	1448–2013

PEST FOCUS

Geneva:
Spotted tentiform leafminer 2nd flight began 6/10. DD(base 43°F) accumulated since then = 1269. **Comstock mealybug** crawlers emerging in Wayne County.

Highland:
Obliquebanded leafroller 2nd flight beginning.

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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