scaffolds

Update on Pest Management and Crop Development

F R U I T J O U R N A L

March 28, 2011 VOLUME 20, No. 2 Geneva, NY

INSECTS

BACK TO THE FUTURE

GETTING THE MOST OUT OF BIG OIL (Art Agnello, Entomology, Geneva)

❖❖ We've all been keeping a nervous eye on the steadily increasing price of crude oil on the international market (now well over $100/barrel) and dreading the inevitable effect this will have on our gas prices, which is something that is unfortunately out of our control. However, it would be doubly unfortunate if this economic argument were to persuade growers against the use of prebloom oil sprays in some situations where they might be the best option for early season mite management programs. This is one of those tried-and-true tactics that has simply maintained its utility over time, irrespective of the time scale we're talking about here.

It's clear from a reading of early literature that knowledge of petroleum's existence as a substance from the Earth dates back at least to the 1st century AD. The writings of Pliny the Elder (in 77 AD) make mention of petroleum as an inflammable mud from a marsh in Samosata, on the west bank of the Euphrates River in southwestern Turkey. He reported that 'When this touches anything solid it sticks to it'. Although he gives no direct evidence of being aware of its value as a pest control substance, there are indications that Roman citizens of his time were on this track in their early efforts to eliminate pests of the home orchard, vineyard and garden. Insects reportedly affecting fruit trees and vines included 'worm-disease, wood-maggots, horned insects and leaf-rolling caterpillars'. One remedy was to boil down two gallons of olive oil and mix it with a third part of bitumen and a quarter part of sulfur. (This, it was cautioned, must be done in the open air because the mixture could catch fire indoors.) The preparation was to be smeared around the bases and under the arms of the vines, which would 'prevent the caterpillar'. Ants were kept away from trees by smearing the trunks with a mixture of red earth and tar. From these recommendations, it is apparent that the protective qualities of complex hydrocarbons were already being examined nearly 2000 years ago.

[However, it must also be noted that this was an era of certain pest-mitigating tactics that relied more on traditional lore than empirical proof. For instance, to protect the tops of the trees against caterpillars and pests that produce decay, Pliny advised touching them with the gall of a green lizard. It was also said that cat-

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IN THIS ISSUE…

erpillars could be totally exterminated in gardens by fixing up on a stake the skull of a female animal of the horse class, or a river crab hung up in the middle of the garden; but I digress.]

Returning to more modern times, the use of horticultural mineral oil as an early season pest management tactic is nowhere near as universal a practice as it used to be years ago, when mites and scales were more problematic and the options for dealing with them were less abundant. Nonetheless, those of us familiar with fruit insect and mite trends still believe it is worthwhile to consider the use of oil applications for early season mite and insect control in both apple and pear plantings, because of its effectiveness, relative affordability, and safety from a biological and pesticide resistance perspective. Exploiting the most acceptable spraying conditions to maximize tree and block coverage can be a challenge in our area, but few pest management efforts have such potentially high returns when all factors are taken into account.

Mite and scale population trends are typically not the same each year, and weather conditions are certainly among the most variable of factors in the pest scenario from one year to the next, also. Before you decide that it's too much trouble or cost to invest in a prebloom spray of oil, be sure you're aware of how much it could cost (biologically as well as financially) if a rescue treatment for mites or scales ends up being necessary later in the season.

Probably first chronologically, early oil applications are useful against pear psylla all throughout the swollen bud stage. Although it's capable of killing adults and nymphs that are directly contacted, oil is recommended mainly because the residue repels adult females looking to deposit their eggs, and this continues for an extended period after treatment. The objective of using oil is to delay the timing of any needed insecticide spray until as late as possible before (or after) bloom. Oil rates depend on when you start: If your buds are at the dormant stage, one spray of 3% oil, or two of 2% through green cluster are recommended; if you start at swollen bud, one spray at 2% or two at 1% up to white bud should be adequate for this purpose, especially if applied as soon as the psylla become active (50°F or above). This will also give some European red mite control at the same time.

Notes from Chappie the Elder

The following advice developed from Paul Chapman's original research is essentially unchanged from what I print every spring, which shows the durability of not only the information, but also of a crop protectant that's still as good as it used to be:

A delayed-dormant spray of petroleum oil in apples from green tip through tight cluster can be a favored approach for early season mite control, both to conserve the efficacy of and to help slow the development of resistance to our contact miticides. Our standard advice has been to try for control of overwintered eggs using 2 gal/100 at the green tip through half-inch green stage, or 1 gal/100 at tight cluster; this assumes ideal spraying conditions and thorough coverage. Naturally, this is not always achieved in real life, mainly because

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is published weekly from March to September by Cornell University—NYS Agricultural Experiment Station (Geneva) and Ithaca—with the assistance of Cornell Cooperative Extension. New York field reports welcomed. Send submissions by 3 pm Monday to:

scaffolds FRUIT JOURNAL
Dept. of Entomology
NYSAES, Barton Laboratory
Geneva, NY 14456-1371
Phone: 315-787-2341 FAX: 315-787-2326
E-mail: ama4@cornell.edu

Editors: A. Agnello, D. Kain

This newsletter available online at:
http://www.scaffolds.entomology.cornell.edu/index.html

of weather and coverage challenges, coupled with the difficulty of getting to a number of blocks during a fairly brief window. It is possible for mites to start hatching when the trees are at solid tight cluster, so the suffocating mode of action tends to be compromised if the nymphs are able to pick their way through the droplets or dodge them entirely. Let practicality determine how best to use the following guidelines.

First, to be sure that mites are in the egg stage, start on your blocks as soon as the weather and ground conditions permit, even if this means using a higher rate. Depending on how heavy the snowfalls have been in certain areas, local conditions will be the prime determinant of how easily you can get through the rows early on. Also, tend toward the high end of the dosage range, especially if there's been no frost during the 48-hour period before your intended spray, and no danger of one for 24–48 hours afterwards. For example, use 1.5 gal/100 if the buds linger somewhere between half-inch green and full tight cluster during your chosen spray period.

Obviously, good coverage of the trees is critical if you're to take advantage of oil's potential efficacy; this in turn requires adequate spray volume delivered at an appropriate speed. Experience and research have shown that a 1X concentration (300 gal/A) in large trees is clearly preferable; however, if all other conditions are optimal (weather, speed, calibration), then 3X, or 100 gal/A, is the highest concentration that should be expected to give acceptable control at any given time. Growers like to concentrate more than this to save time and the hauling of extra water, but reducing coverage too much can compromise your efforts if you end up covering only a small fraction of the egg population with the residue.

Don't limit this mite control tactic just to apples and pears. Talks with stone fruit growers have reminded us that many cherry, peach and plum plantings can suffer equally serious European red mite infestations that weren't given the early season attention they might have needed. We don't have hard and fast threshold guidelines for these crops, but stone fruit plantings with a history of past ERM problems should be examined for presence of the red overwintered eggs, and if they're numerous enough to see without a hand lens, then a prebloom application of 2% oil would be a prudent tactic to help ward off this damage, particularly if your fungicide program at this time doesn't present any compatibility problems.

Not Drawn to Scale

San Jose scale is one of the historically important pests that has responded to our changing insecticide programs during the last few years. The disappearance of products like Penncap-M and Lorsban from our list of summer spray materials has been at least partly responsible for the fact that SJS persists or has returned to pest status in a number of orchards. It's therefore worth pointing out that a 2% oil treatment at half-inch green will control the immature forms overwintering on the trees, and this is a preferred treatment if no other problem insects need to be controlled. Combining the oil with an insecticide generally has not been shown to be more effective than using the oil (or insecticide) alone, except possibly in the case of a more recent alternative, Esteem, which has shown good efficacy when mixed with 2% oil at the pre-pink timing.

Finally, we have heard of some growers who have recently expressed unfounded concern that oil has a negative impact on the health of their trees. To this I can only re-assert that petroleum oil has been used for well over a century as a delayed-dormant treatment to control mites, scales, and even some aphids, with no ill effects on the health of the tree or the current season's crop. The primary cautions we advise when using oils at that time of year stem from their use a) in association with or too close in time to applications of sulfur-containing fungicides, or b) just before or too soon after sub-

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freezing temperatures; both of these practices risk the occurrence of phytotoxicity, as oil's penetrant activity is capable of damaging the bark, wood, or bud tissues in these situations. Application of oil under any circumstances that do not allow for normal drying to occur can also result in some tissue damage. Also, oil sprays during pink bud can cause burning of the sepals or petals, which may or may not affect normal pollination and fruit set. ❖❖

GENERAL INFO

DATA BASED

KEEPING TRAC
(Julie Carroll, IPM, Geneva)

TracApple Software for 2011

❖❖ The 2011 version of TracApple (and TracPear, TracCherry, TracStoneFruit) will be coming out soon. Trac is an Excel-based record-keeping and reporting system for spray records. Visit http://nysipm.cornell.edu/trac/downloads/default.asp for updates on availability and http://nysipm.cornell.edu/trac/ for information about what Trac can do for you. ❖❖

DISEASES

EYE ON COPPER

SPRING COPPER SPRAYS FOR FRUIT DISEASES
(Dave Rosenberger, Plant Pathology, Highland)

❖❖ Copper sprays can be applied in early spring to control several important diseases on tree fruits. On apples, pears, and quinces, copper applied at green tip may help to suppress fire blight in orchards where blight was present in either of the two previous years. A copper spray between bud swell and bud burst can be used to control peach leaf curl on peaches and nectarines. On sweet cherry, tart cherry, and apricot, a copper spray at bud burst may help to suppress bacterial canker, a disease caused by *Pseudomonas syringae*.

Which copper product should I use?

A recent search of the New York State pesticide registration database turned up more than 40 different labels for copper products registered for use on at least one tree fruit crop. Thirteen products were clearly designed for home gardens and/or organic famers, but tree fruit growers have many options when choosing a copper fungicide. The crops, diseases, and application timings listed vary greatly from one product to another. When using copper sprays, read the product label to ensure compliance with label restrictions.

For tree fruit applications, "fixed" coppers are more effective than copper sulfate applied alone. The term "fixed" copper refers to copper products that are formulated or tank-mixed in such a way as to create relatively insoluble or "fixed" deposits of copper on plants. Copper ions are gradually released from these deposits when plants are wet, and it is the copper ions that control diseases. Copper ions can also cause phytotoxicity to the treated crop if

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the concentration of copper ions is too high. Because copper ions are released slowly from the spray deposits created by fixed copper sprays, the fixed coppers are usually less phytotoxic to plants and provide better residual activity against diseases than can be achieved with a non-fixed form of copper.

Copper hydroxide and copper oxychloride are both fixed coppers, whereas copper sulfate is not. If copper sulfate is mixed with spray lime to make a Bordeaux mixture, then the copper sulfate and calcium in the lime react together to form a fixed copper. Product labels for products containing copper sulfate can be confusing: The labels for Cuprofix Disperss indicate that the formulation contains basic copper sulfate, so one might assume that this is not a fixed copper and that it will therefore lack the residual activity found in fixed coppers. However, Cuprofix Disperss is formulated with gypsum, a carrier that contributes the calcium ions needed to convert the copper sulfate into a fixed form of copper, and it therefore should work as well as any of the other fixed copper products.

What is the best product for any given application? Research in other cropping systems has shown that the major factor affecting efficacy of fixed copper sprays is the amount of elemental or metallic copper that is applied. The metallic copper equivalent is listed on all copper labels, usually in parentheses below the list of active ingredients. The metallic copper equivalent is always lower than the percent of the formulated copper molecule (e.g., copper hydroxide) listed on labels because the copper ion is only one part of the copper molecule.

Although the rate of metallic copper that is applied has the greatest effect on efficacy, the size of the copper particles in the product formulation can also play a role. There is evidence from both old (1940s and 1950s) and recent studies indicating that products that contain a finer grind of copper are often a bit more effective than products with larger particle sizes because the smaller particles are less subject to wash-off by rain or removal by wind. (Yes, one study has shown that wind alone can significantly reduce amounts of residual copper on plant surfaces!) Some manufacturers claim that their finely ground copper formulations are safer and/or can be used at lower rates of metallic copper per acre than older formulations. These claims may hold true for vegetable crops, where repeated applications are needed to cover new foliage as it develops and the improved retention with finely ground products can compensate for lower application rates so long as coverage is renewed at regular intervals. On tree fruits, where we depend on the long-term residual activity from a single copper spray, the best evidence suggests that the rate of metallic copper per acre is still the primary factor impacting efficacy.

Thus, for the most part, copper products used for dormant or delayed-dormant sprays on tree fruits can be selected based on the cost per pound of elemental copper. If costs per pound of metallic copper are similar for finely ground coppers and for older formulations, then go with the finely ground product. In addition to efficacy considerations, some of the liquid formulations or finely ground dry formulations may go into solution more easily in the sprayer tank than older and coarser formulations. Convenience for measuring and mixing should also be a consideration when deciding which product to purchase.

Copper sprays for pome fruits

A copper spray applied at the green tip bud stage has been recommended for more than 40 years as part of a fire blight control strategy for apples and pears. Copper residues on the twigs and branches kill bacteria as they are released from overwintering cankers. Cankers usually begin releasing bacteria when trees are at the pink or bloom stages. However, copper must be applied at green tip to avoid the phytoxicity that can occur with later applications.

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Studies that I conducted in the early 1990s showed that when three inches of rain occurred between the copper application and bloom, virtually all of the copper residues were removed from the tree prior to bloom. In those cases, we would not expect any benefits from the copper spray on apples, because the copper residues were lost before fire blight bacteria become active. However, in years when there is less than three inches of rainfall between the copper application and bloom, the low levels of residual copper that persist on tree bark are apparently sufficient to reduce populations of the fire blight bacterium.

In years when no rain occurs between the green tip copper application and bloom, fruit may develop copper-induced russetting because too much copper residue will still be present at bloom. To avoid the potential for phytoxicity on apples, the copper rate should be reduced for any applications made after green tip, and no copper sprays should be applied to apples after half-inch green unless the block is intended for processing and fruit russetting is not a concern.

The old literature reports that copper residues can cause foliage injury if frosts occur soon after the copper application. This injury can be avoided by applying the copper spray before buds have produced much green tissue. However, if the copper spray is applied near half-inch green, then applications should be avoided ahead of predicted frosts.

Acids applied to trees that were recently treated with copper can cause a massive release of copper ions, thereby increasing chances that the copper spray will cause phytotoxicity. Therefore, trees treated with a copper fungicide should NOT be sprayed with Aliette or any of the phosphite fungicides for at least several weeks after the copper spray was applied. The phosphite products include ProPhyt, Phostrol, Agri-Fos, Nutriphyte, and many others.

A copper spray applied at silver tip or green tip will provide the same degree of protection against apple scab that one would expect from an application of a mancozeb fungicide. Thus, a copper spray will protect trees from scab for the next 7–10 days, and no other fungicide is needed during that time period.

Copper sprays for stone fruits

Copper sprays applied either at leaf fall in autumn and/or as a dormant spray in spring have been very effective for controlling bacterial canker *(Pseudomonas* species) on sweet cherries and leaf curl (*Taphrina deformans*) on peaches and nectarines. An application of copper at bud burst on apricots may also help to prevent the severe bud blast that can occur if apricots are colonized by *Pseudomonas* during a cool wet spring when a light frost occurs during bloom. In some years and locations, the combination of *Pseudomonas* and light frost has caused nearly 100% kill of apricot flowers and foliage. Although no research has been conducted on the efficacy of copper sprays for preventing such damage, copper residues from a spray at bud burst should help to suppress bacterial populations that contribute to spur death following frost events.

Ecological impact of copper sprays

Copper fungicides are receiving increasing scrutiny because copper is a heavy metal that can accumulate in soils. Copper has many adverse effects on soil ecology, especially in soils with a low pH. Adverse effects include toxicity to earthworms and other soil microorganisms. Most studies on copper accumulation in soils have been done in cropping systems where multiple copper sprays were applied every year for many years (e.g., grapes, bananas, avocados). Nevertheless, the spring copper spray recommended for pome fruit and stone fruit diseases may contribute to gradually increasing levels of copper in soils. Copper sprays should be used sparingly and only where we have no good alternatives for disease control. ❖❖

PHENOLOGIES

Geneva: All dormant.

UPCOMING PEST EVENTS

	43°F	50°F
Current DD accumulations (Geneva 1/1–3/28/11):	44.3	10.2
(Geneva 1/1–3/28/2010):	69.2	22.3
(Geneva "Normal"):	60.3	20.8

Coming Events:	Ranges (Normal ±StDev):	
Green fruitworm 1st catch	60–134	18–60
Pear psylla adults active	31–99	8–34
Pear psylla 1st oviposition	40–126	11–53
Redbanded leafroller 1st catch	108–174	39–79
Spotted tentiform leafminer 1st catch	113–199	41–93
McIntosh silver tip	59–111	19–43
McIntosh green tip	95–147	36–62

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.

This material is based upon work supported by Smith Lever funds from the Cooperative State Research, Education, and Extension Service, U.S. Department of Agriculture. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the view of the U.S. Department of Agriculture.