scaffolds
FRUIT JOURNAL

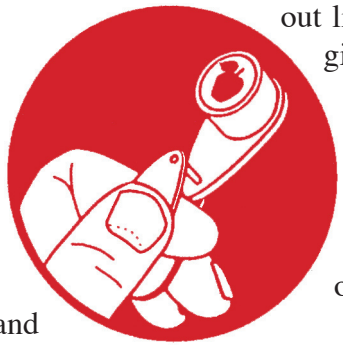
Update on Pest Management and Crop Development

April 2, 2007 VOLUME 16, No. 3 Geneva, NY

INSECTS

ROLL OUT THE BARREL

DRUM SOLO (Art Agnello, Entomology, Geneva)



❖❖ We're still playing cat and mouse with true spring weather, but eventually things will settle down and the freezing nights will be replaced with something bearing more resemblance to an actual growing season, which will make it possible to consider the year's first spray applications. To the extent that weather and orchard floor conditions make it possible, we still consider it worthwhile to use oil applications for early season mite and insect control in both apple and pear plantings, because of its effectiveness, affordability, and relative 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 everything falls properly into place.

Lessons From Our Elders

A reading of early literature shows that knowledge of petroleum's existence as a substance from the Earth dates back at least to the 1st century AD. The writings of the early extension entomologist Pliny the Elder 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.' There is also a passage regarding naphtha as being a similar substance that flows out like 'liquid bitumen'. 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 the lees 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

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UPCOMING PEST EVENTS

PHENOLOGIES

PEST FOCUS

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.

Pear Psylla

As we've already had a preview of a few sunny days and warm weather, I know that pear psylla eggs are already present. Even though it's impossible to be sure your pear trees are all protected by the time the very first psylla adults start flying and (presumably) ovipositing, several nice warm days in a row at this time of year don't result in more than a small number of psylla eggs, so you'll be more than adequately protected if you prepare now to get out there during the first real stretch of good weather (stay tuned).

Early oil applications can be useful against pear psylla all throughout the swollen bud stage; although it's capable of killing adults and nymphs that are contacted directly, oil is recommended mainly because the residue has a repellent effect on adult females looking to deposit their eggs, and this lasts for an extended period after treatment. The strategy behind the use of 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 red mite control at the same time.

European Red Mite and the Chapman School

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

A delayed-dormant spray of petroleum oil 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, real life doesn't always measure up, mainly because of weather and coverage challenges, coupled with the difficulty of getting to a number of blocks during this transient 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 wade through or avoid the droplets. 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 snowfalls have been in certain locations, local conditions will be a prime determinant of how easily you can get through the rows early on. Also, tend to-

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ward 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.

Naturally, good coverage of the trees is critical if you're to take advantage of oil's potential efficiency; 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 larger 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 wipe out your efforts if you end up getting only a small fraction of the egg population under the residue.

Don't limit this mite-control tactic just to apples and pears. Talks with stone fruit growers recently 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 measure to help stave off this damage, particularly if your fungicide program at this time doesn't present any compatibility problems.

San Jose Scale

It's been a concern that our recent insecticide withdrawals and restrictions may have been promoting a return to the pest profiles of the past, with direct fruit pests (internal leps, apple maggot, various bugs) taking precedence over the indirect foliar feeders. San Jose scale is one of those old standbys that already has been responding to some of the regulatory actions of 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 nymphs, and this is a preferred treatment if no other problem insects need to be controlled. Combining the oil with an insecticide has not been shown to be more effective than using the oil (or insecticide) alone, except sometimes in the case of one newer alternative, Esteem, which has shown good efficacy when mixed with 2% oil at the pre-pink timing.❖❖

PSYLLA PSPRAYS

HUDSON VALLEY PSYLLA MANAGEMENT OPTIONS FROM PRE-BLOOM TO PETAL FALL
(Peter J. Jentsch, Entomology, Highland)

❖❖ Pear psylla, *Cacopsylla pyricola* Foerster, is the primary insect pest of pears in the northeast, driving pest management decisions during the prebloom period. Adults overwinter along the woodland edge as well as within the orchard. They remain well hidden among the scales of trunk bark and the branch canopy during cooler temperatures, visibly increasing in number on trees as temperatures rise, and migrating into blocks throughout the early part of the season. Adults will oviposit onto branches along the basal plates of buds throughout the month of April, allowing nymphs easy access to newly developing foliage.

Strategies to manage pear psylla during the prebloom period are diversifying as new materials with different modes of action become available in NYS. The traditional prebloom oil application can be made as the first egg is observed during a 3-min-

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ute observation of pear buds. In the Hudson Valley during the 2006 growing season, we saw sustained oviposition on 1 April, and first hatch of nymphs occurred on 24 April. The purpose of the prebloom application is to reduce adult oviposition and subsequently force the population to synchronize egg deposition and nymph hatch. By doing so, we can make a timely application against the nymphs as they hatch more uniformly, because they are more susceptible to insecticides at this early developmental stage. To be effective, oil should be applied well before significant egg laying begins. A dormant spray of 3% oil would be made if only one oil application is planned. This rate will also reduce overwintering populations of San Jose scale, European red mite, pearleaf blister mite, and Comstock mealybug. A second approach would be 2% oil applications at 7- to 14-day intervals, allowing for somewhat longer inhibition of egg laying.

Two relatively new approaches for prebloom psylla management can be rotated into our IPM programs. The first is an additional option for oviposition deterrence using Surround WP, a kaolin clay product, at 50 pounds per acre, made at the first egg observation. In the northwest pear growing region, with their sparse rainfall that allows for long insecticide residual periods, this approach has been used quite successfully in regional applications. In a trial conducted at Cornell's Hudson Valley lab in 2006, Surround WP gave significantly better control of pear psylla adult egg laying than 2% oil at the same timing in a single spring application (which received considerable rainfall, I might add).

The second approach is an ovicide, Esteem 35WP, used prebloom to kill the egg stage of psylla and reduce the viability of eggs laid by treated adults. It should be applied prior to sustained egg laying, about the time oil or Surround applications would be made, with 0.25% v/v horticultural spray oil. Esteem may be applied once prebloom at 16 fl oz/A, or once prebloom and once at petal fall at 13–16 fl oz/A, as a tactic for both psylla reductions and as a resistance management strategy. Remember, its mode of action is as an ovicide, so it will not reduce the adult or nymph population directly, and is most effective if the material is on the wood or foliage prior to the eggs being deposited.

Using oil is a prerequisite to at least two follow-up strategies. One option, after oil, is an adulticide to kill the adults after they have completed migration into pear orchards, and before significant eggs have been laid. In the Hudson Valley, oil is generally applied during the first week of April and migration is completed in late April. Adulticides would be employed from mid- to late April to significantly reduce the adult population. The choices for managing adult psylla include: Thionex 50WP at 1/2–1 lb./A; the neonicotinoids Actara 25WDG at 5.5 oz/A and Assail 30SG at 4.0–8.0 oz/A, and the pyrethroids (Ambush 25WP at 12.8–25.6 oz/A; Asana XL 0.66EC at 2.0–5.8 oz/100 gal; Pounce 3.2EC at 8–16 fl oz/A; Pounce 25WP at 12.8–25.6 oz/A; Proaxis 0.5CS at 2.6–5.1 fl oz/A; or Warrior 1CS at 2.6–5.1 fl oz/A). In general, researchers have found the pyrethroids to be less effective at higher temperatures on many different insect species. They should be considered for use primarily during the spring and not during the heat of the summer. They have been found to be more effective with the addition of PBO (piperonyl butoxide). Incite, a PBO synergist, when applied in a tank mix or 4–6 hours prior to the pyrethroid application, will increase the pyrethroid's efficacy. The PBO acts to reduce the insect's ability to metabolize or detoxify the pyrethroid, allowing it to reach its intended target site within the insect.

And, to add to the discussion of early pest management for psylla, we would be remiss in not mentioning that postbloom Agri-Mek has been the standard method of psylla management in NY since 1996. Although we have not seen Agri-Mek experience a failure or loss of efficacy in NYS, this is all the more reason to consider a rotational program of materials for resistance management purposes.

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Agri-Mek can be used from petal fall to about 4 weeks post-PF, but its efficacy decreases after foliage hardens off. It requires the use of 0.25% v/v horticultural spray oil to penetrate the foliar waxy cuticle and translocate within the leaf for optimum uptake during nymphal feeding. Agri-Mek has been used successfully in multiple applications of 20 oz/A beginning at 10–14 days after petal fall, with a follow-up application in 21 days as per label requirements, totaling no more than 40 oz/season. The later application is targeted at the new foliage preferred by psylla nymph populations.

An alternative to Agri-Mek is Actara 25WDG at 5.5 oz/A. One of the neonicotinoid class of insecticides, it's effective against both nymph and adult populations. We have found it has slightly better efficacy when used with a 0.25% v/v horticultural spray oil. It will also control plum curculio and Comstock mealybug when applied at petal fall. It's not registered for use in Nassau or Suffolk Counties and the label allows only one application per season.

Another option as an Agri-Mek rotational material for pear psylla management would be the highly refined PureSpray 10E oil at 1% in a season-long regimen at 14-day intervals. In 2006, we conducted a trial using 1% Damoil applications at 2-week intervals, which were equivalent to Agri-Mek in managing both psylla adult and nymph populations, and saw lower leaf drop associated with Fabarea leaf spot at the end of the season. Since Fabraea leaf spot applications of Mancozeb are applied to pears on a 10–14-day schedule early in the season and 3-week intervals later in the season most years, the addition of 1% oil to a tank mix of Mancozeb up to 77 days PHI, and then switching to Sovran or Flint in late summer, would make for a viable control strategy for psylla. Since pear psylla can facilitate the spread of leaf spot during summer, controlling psylla is an important aspect of Fabraea management in high-pressure orchards. As with general oil use, it should be applied under good drying conditions and temperatures below 80°F to reduce the risk of phytotoxicity to foliage and fruit.

The use of oil last season was not without its drawbacks. In Bartlett, we saw enlarged lenticels at the calyx end of fruit in harvest evaluations and on the wood during our winter pruning. This may not be a problem in pick-your-own blocks, where fruit finish is not as critical as fruit "on the shelf". As with most materials, markets will dictate many of the pest management protocols.❖❖

BEAT THE HEAT

LAST CHANCE TO PRUNE FOR VIGOR
(Steve Hoying, Horticultural Sciences, Highland)

❖❖ Green tip is right around the corner, and trees that need to be pruned to promote vigor need to be done now before growth starts. Trees planted last year, particularly those on full dwarfing rootstocks, frequently do not grow sufficiently the year of planting and need dormant pruning to promote growth. This is also the perfect timing to carefully examine these newly planted trees for structural deficiencies and deer damage that is more easily corrected at this stage.

First-year tree growth from unbranched trees should produce 3 or more scaffolds that are 10 inches or more in length. Each of these scaffolds should not be larger than 1/2 the diameter of the trunk where each insert, and have relatively flat crotch angles. Upright limbs are suitable as long as crotch angles are flat. The leader should be more than 12 inches in length and undamaged by deer, re-growth or mildew.

Starting over from scratch is the best approach for those trees that do not meet the minimum requirements. To start a tree over, remove

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HORTICULTURE

Fig 1. Flush cuts reduce shoot growth.

all shoots and limbs below the zone where you want scaffolds to form using a flush cut (Fig. 1). A flush cut is made by cutting the limb from the trunk very closely. This cut likely will damage the collar area around the shoot where adventitious buds form and prevent new shoots from growing.

Next, remove all scaffolds shoots in the "scaffold zone" using a "bevel cut" (Fig. 2). Using a bevel cut is important, as removing limbs at this point allow a new weaker shoot to replace it from adventitious buds located below where the original limb was removed. By removing almost all last year's growth, you create a tree with an established root system that can easily feed all the new growth. New shoot growth tends to be flat, vigorous and evenly spaced. This balanced shoot growth prevents any one limb from overpowering any other and creates a tree without gaps. If large, vigorous scaffolds are allowed to remain, they compete with the trunk and often choke the trunk at the point of insertion of these large limbs. This is particularly true when fewer scaffold limbs exist. This replacement limb quickly becomes one of the primary bottom scaffold limbs.

Fig 2. Bevel cuts promote shoot renewal from adventitious buds located in the collar below the removed limb.

Finally, re-head the tree, leaving only 3 or 4 buds from last year's leader growth. When growth starts, select a single bud as leader.❖❖

MAY WE RECOMMEND

HARD TO PUT IT DOWN

❖❖ The 2007 edition of the Cornell Pest Management Guidelines for Commercial Tree-Fruit Production is now available. Highlighted changes and additions for this year's edition include the addition of information on federal private pesticide applicator recordkeeping requirements, an expanded sprayer technology section, and the addition of growth regulator use guidelines for apricots, plums, and prunes. As usual, pesticide listings and registration information has been revised and updated.

The 2007 Pest Management Guidelines for Commercial Tree-Fruit Production can be obtained through your local Cornell Cooperative Extension office or directly from the Pesticide Management Education Program (PMEP) Educational Resources Distribution Center at Cornell University. To order from PMEP, call (607) 255-7282, send an email to patorder@cornell.edu, or order on-line at: http://store.cce.cornell.edu/pmep. An online version will be available soon.❖❖

GENERAL INFO

DISEASES

KICK BACK!

APPLE SCAB AND POST-INFECTION FUNGICIDES (PART I) (Wolfram Koeller, Plant Pathology, Geneva)

❖❖ Managing apple scab with more or less modern post-infection fungicides without considering the level of resistance the scab fungus has developed has become a challenging task. Starting in this issue with Part I, a three-part series will hopefully answer three questions: What do we know, where do we stand, and where can we go from here?

Two very different classes of fungicides are currently available for the control of apple scab. They are the old solely protective fungicides and the more modern fungicides providing post-infection or "kickback" activity. While the scab fungus never has developed and most likely never will develop resistance to the solely protective fungicides, all current "kickback" fungicides on the market already have or will encounter the plight of resistance. This leaves us with an important question. Should or can we rely on the purely protective fungicides in our scab management programs, or should we still include fungicides that provide "kickback" activity, and if "yes", under what conditions?

The current solely protective scab fungicides available are the products containing mancozeb (Dithane, Manzate, Penncozeb) and the closely related Polyram, and captan in its various formulations. For the 2007 scab season, there are no label changes for these products. As the term "protective" implies, these fungicides can only protect susceptible leaves (and later in the season, developing fruits) from infections by the scab fungus. Numerous results in our Geneva test orchards have shown that these protective fungicides do not control scab when applied 24 hours after an infection period started at a temperature just "right" for an infection. Protective fungicides, by their nature, will provide very limited or no "kickback" activity, but even when they are applied "too late", they will not be totally wasted. They will protect against the next following infection period, which will occur sooner or later.

However, leaves will continue to grow, and depending on the speed of their growth only determined by the temperature, protective fungicide deposits on growing leaves might become so small that even redistribution of these deposits during rain, which always is accompanied by considerable wash-off from the surfaces, will not suffice. This is the principle underlying the old 7-day spray schedule recommended for all solely protective fungicides available.

Reliance on protective fungicides alone opens the questions of when to start the spray program in early spring, and when to renew protective coverage. Fortunately, the Mills Table published in 1944 and revised over the following 60 years, incorporating new knowledge about the biology of the scab fungus, has provided us with a reliable tool of using forecasting to help apple growers time their application of protective fungicides. At our Geneva Tree Fruit & Berry web site (nysaes.cornell.edu/pp/extension/tfabp/index.html) we describe a "Modified Mills Table" and a "Revised Mills Table". The "Revised Table" is more conservative than the "Modified Mills" Table in calculating the duration of leaf wetness required for establishing a scab infection period, in particular at low temperatures. In addition, the "Revised Table" does not account for the severity of infection periods.

From a practical point of view, two revisions made to the original Mills Table appear more important than others. It was realized that not the duration of rain but rather the duration of leaf wetness are important parameters in constituting an infection event, and that intermittent periods of drying

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for 24 hours will not stop scab infections once they were initiated. Such additional wetting periods are often provided by dew formation at low temperatures at night.

Regardless of the many refinements made to the original Mills Table, it will remain as a reliable tool of determining an infection period AFTER the fact. Although much progress has been made in forecasting the weather locally, the initiation and continuation of scab management with protective fungicides must take the "after the fact" precision of all Mills Tables into account. Any attempt to stop the development of scab lesions after infections have taken place, be the reasons intentionally or mandated by adverse weather conditions, require more specific fungicides with "kickback" activity, which protective fungicides will only provide for a very limited period of time.

Additional tools, which are all accessible through the Tree Fruit & Berry web site, include models aimed at a more precise timing of fungicide applications during the primary scab season. Only as a reminder, the very first scab infection in early spring, most often after rain around green tip, is caused by ascospores formed in the litter of leaves with scab lesions at the end of the previous season. If the orchard was "very clean" the year before, the total number of ascospores shot into the air will be very small, and the likelihood that these few ascospores will "find" a susceptible green tip will also be very small. Under such optimal conditions it was shown that the green tip spray can be omitted without falling behind in the battle with scab right at the onset of infections during early spring.

A second model takes into consideration that ascospores formed in the leaf litter must "mature" before they are shot into the air and are ready to infect green tips. The ascospore maturity model is dependent on the degree days accumulated after the model is set into motion. It must be emphasized, however, that the model is dependent on local temperature data and, in addition, has a large margin of error during the early part of spring. The magnitude of this error might even be different from location to location. For example, during four consecutive years of trapping and counting ascospores shot into the air after rain in early spring, we found far more ascospores in our Geneva test orchard than predicted to be "mature" according to the ascospore maturity model. Therefore, it remains imperative that the scab program be initiated BEFORE the initial infection period occurs around green tip, if solely protective fungicides are considered to be the mainstay of a season-long scab management program, and if the orchard was not "super clean" at the end of the previous season.

What do all of these considerations have to do with fungicide resistance? The answer is that they do. Many of our "kickback" fungicides are applied in mixture with a protective fungicide, most frequently with mancozeb at the low 3 lb/A rate. As long as the scab fungus has not developed resistance to the "kickback" mixing partners, this mixture strategy is sound and successful. The "kickback" fungicide controls scab already established inside leaves or developing fruits, and mancozeb provides additional protection toward the next following infection period. As resistance to the "kickback" mixture component develops over time, the solely protective partner will carry more and more burden in the overall control of scab. During "mild" scab years and on less scab-susceptible cultivars such as Red Delicious, Paulared or even Empire, the low mancozeb rate alone is sufficient to provide satisfactory levels of scab control even after the "kickback" mixing partner is no longer fully effective because resistance developed. But every so often, scab pressure will be so high that mancozeb applied at a low rate and at intervals exceeding 7 days will fail to provide season-long control of scab.

In the following two parts of this series, I will outline the status quo of where we stand regarding resistance to all of the five classes of "kickback" scab fungicides currently on the market.❖❖

PHENOLOGIES

Geneva:
Apple (McIntosh) - silver tip
Apple (Red Delicious) - dormant
Apple (Empire) - silver tip
Pear (Bartlett) - swollen bud
Cherry (sweet/tart) - dormant

Highland:
Apple (Ginger Gold) - green tip
Apple (McIntosh) - silver tip
Pear (Bartlett/Bosc) - swollen bud
Peach - swollen bud
Plum - dormant

UPCOMING PEST EVENTS

	43°F	50°F
Current DD accumulations (Geneva 1/1–4/2/07):	95	36
(Geneva 1/1–4/2/2006):	116	40
(Geneva "Normal"):	88	39
(Geneva 1/1–4/9/2007, Predicted):	116	44
(Highland 3/1-4/2/07):	50	17

Coming Events:	Ranges(Normal±StDev):	
Green fruitworm 1st catch	36–173	12–54
Pear psylla 1st oviposition	25–147	1–72
McIntosh at green tip	64–163	19–74
Red Delicious at green tip	92–173	36–78

PEST FOCUS

Geneva:
Pear psylla adults active.

Highland:
Green fruitworm flight has begun.
San Jose scale DD base 50 from March 1 = 17.1

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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