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**ORCHARD RADAR DIGEST**

- We're taking off

**Codling Moth**
1st generation 3% CM egg hatch: June 7 (= target date for first spray where multiple sprays needed to control 1st generation CM).
1st generation 20% CM egg hatch: June 15 (= target date where one spray needed to control 1st generation codling moth).

**Lesser Appleworm**
1st LAW flight, 1st trap catch: May 1.

**Mullein Plant Bug**
Expected 50% egg hatch date: May 16, which is 2 days before rough estimate of Red Delicious petal fall date.

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**Geneva Predictions:**

**Roundheaded Appletree Borer**
RAB adult emergence begins: May 27; Peak emergence: June 12.
RAB egglaying begins: May 27. Peak egglaying period roughly: June 27 to July 12.

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**WHEELS UP**
(Art Agnello, Entomology, Geneva)
The most accurate time for limb tapping counts, but possibly after MPB damage has occurred, is when 90% of eggs have hatched. 90% egg hatch date: May 21.

**Obliquebanded Leafroller**
1st generation OBLR flight, first trap catch expected: June 7.

**Oriental Fruit Moth**
1st OFM flight starts: April 16.

**San Jose Scale**
First adult SJS caught on trap: May 11.

**Spotted Tentiform Leafminer**
1st STLM flight, peak trap catch: April 28.
1st generation sapfeeding mines start showing: May 15.
Optimum sample date is around May 17, when a larger portion of the mines have become detectable.

**White Apple Leafhopper**
1st generation WALH found on apple foliage: May 6.

My closet tends to get crowded at this time of year, since the premature warm weather has prompted me to put in a bunch of summer shirts, but I can’t be sure the cool weather won’t return, so the winter stuff is still in there, too. The temperatures are back to more seasonal levels, but, it is certain that some blocks in the state are at pink bud or even bloom already (or will get there this week), while others are still clambering through half-inch green to tight cluster. So never mind what the calendar says, this is a timely opportunity to get prepared for the rush of pink bud pest management issues that always seem to converge over too short a period. A brief assessment of where we stand with insect pests might be useful at this point.

The potential pests of most concern just now are probably **rosy apple aphid** (RAA), **oriental fruit moth** (OFM), and **tarnished plant bug** (TPB), with **European apple sawfly** and **plum curculio** on deck. OFM has already managed to show its furry face well before bloom in the Hudson Valley, and it won’t be very long before biofix is established in a number plantings statewide. In blocks with a history of internal worm infestations, 1 or 2 traps checked weekly might help indicate the relative size of the first generation population this year. This is followed, of course, by the question of how to respond when the numbers start building.

We’re dealing with potentially a lot of record early pest occurrences this season, which brings to mind one of the insights of the philosopher entomologist Yogi Berra, who once said ‘I always thought that record would stand until it was broken.’ However, I might venture a guess that, even

WINKING AT PINK
(Art Agnello, Entomology, Geneva)
though we may get quite a few moths flying during pink and bloom, the overall temperature ranges we’re expecting will result in very little egg hatch until petal fall, when the newly emerged 1st brood larvae will be best handled. Most growers will be using an OP like Guthion or Imidan at petal fall, possibly tank-mixed with a Bt, Intrepid or Proclaim for OBLR, and all of these will have some effect on most OFM populations.

In particularly high-risk situations (that is, where you have had a hard time managing internal leps in the past, and can predict that they’ll be back this year), you might want to substitute a more lep-active material like Avaunt or Calypso for one of your petal fall or (adding Assail to the list of options) first cover sprays. This way you will get an extra jump on the OFM/CM complex during their first generation, while covering the need to protect against other petal fall regulars like plum curculio and European apple sawfly. Added to the scenario is the availability of Delegate and Altacor, which are other options at petal fall to address all the above-noted caterpillars, and, to a lesser extent, plum curculio, although it may be a bit early to formulate a strategy for this period just yet.

According to your personal perspective, RAA and TPB can be either perennial challenges, puzzling but non-fatal occurrences, or else a complete flip of the coin. Do you have them, do you need to treat for them, are you able to control them if you do, and does it matter if you don’t? These pests also have yet to indicate their potential for problems this season, although it’s likely that rosies can be found already in local orchards, given enough inspection. It’s possible to scout for rosies at pink, but this is often not practical, considering all the other hectic activity at this time. TPB is not a good candidate for scouting, and if the bloom period is prolonged by cool, wet weather, a pink spray is of little use. You’ll have to decide for yourself whether this bug is of sufficient concern to you to justify treating (see Peter Jentsch’s article in last week’s issue for a discussion of the factors to take into account).

We have seen few orchards in western NY where TPB control is warranted (and only slightly more in the Hudson Valley), simply because the most effective treatment to use has been a pyrethroid, which: a) kills predator mites, and b) still rarely lowers TPB damage enough to be economically justified. If you elect a spray of Ambush, Asana, Baythroid, Danitol, Leverage, Pounce, Proaxis or Warrior at pink for plant bug, you’ll take care of rosy apple aphid (and STLM) at the same time. If RAA is your main concern, you could elect a pink spray (non-pyrethroid options include Actara, Assail, Beleaf, Calypso, Esteem, Lannate, Lorsban, Thionex, and Vydate) if you have the luxury of a suitable application window. Once again, be sure to consider potential impacts on non-target species such as beneficials, and be aware of your bee supplier’s concerns about effects on pollinating bees.

What else is happening at pink? Spotted tentiform leafminer is laying eggs, but most orchards don’t seem to suffer too greatly from 1st brood leafminer these days, and a sequential sampling plan can be used to classify STLM egg density at pink or of sap-feeding mines immediately after petal fall (see pages 70 and 72 in the Recommends). Treatment is recommended if eggs average 2 or more per leaf on the young fruit cluster leaves at pink, or if sap-feeding mines average 1 or more per leaf on these leaves at petal fall. Sampling can be completed in approximately 10 minutes.

Leafrollers are also out there, but only a portion of the population is active at this time, so while you might get good control of any larvae you spray now, don’t neglect the fact that the rest of the population won’t be out (and susceptible to sprays) until bloom or petal fall, so it’s probably better to wait until then to address this pest.

Finally, if mites normally need attention in a given block, and you haven’t elected (or been able to use) a delayed-dormant oil application as a part of your early season mite management program, you’ll be needing to rely on either: one of {continued...}
the ovicidal acaricides (Apollo, Savey/Onager, Zeal) available for use, whether before or after bloom; a rescue-type product after bloom (add Nexter, Acramite, Kanemite, Portal, Carzol to the above list) that can reduce motile numbers later on if they should begin to approach the threshold; or Agri-Mek, which falls somewhere between these two strategies. Like the true ovicides, Agri-Mek should also be considered a preventive spray, since it needs to be applied early (before there are very many motiles) to be most effective, generally within the first 2 weeks after petal fall. Recall that Proclaim is related to Agri-Mek, and also has some miticidal activity, if you elect to use it at petal fall for leafrollers. Also, as a reminder, Carzol is restricted to no later than petal fall, so it may be of limited use in most programs. For any of the rescue products, the operational threshold in June is an average of 2.5 motiles per leaf (see the chart on p. 73 of the Recommends).

We remind you that the Movento label for all crops states “Do not apply until after petal fall”.

Bayer informs us that “Import tolerances for spirotetramat have been established on key crops within CODEX, the European Union and NAFTA region. We anticipate that import tolerances for Japan and additional crop-specific tolerances in the European Union will be published by the end of June 2010.” For a Link to EPA’s FinalCancellation Order for Spirotetramat, go to: http://www.epa.gov/opprd001/factsheets/spirotetramat-final-cancel-order.pdf.

 ERRATA(673,870),(995,988)

More slip-ups recently found by alert readers of the Recommends:
- p. 120, European red mite: the rate for Apollo should be “4-8 fl oz/A” (instead of “480”!)
- p. 151, Aphids: delete the entry under “Rate/100 gal” (which currently reads “5 fl oz”), and replace with “see label”.
CONTROLLING POWDERY MILDEW ON APPLES
(Dave Rosenberger, Plant Pathology, Highland)

Prebloom fungicide programs on apples are usually aimed at controlling apple scab, but powdery mildew also deserves attention as trees reach the tight cluster and pink bud stages. For the past several decades, apple growers in the northeastern United States could almost ignore powdery mildew so long as they used one of the DMI fungicides in three or four sprays each season. The DMI fungicides (Rubigan, Procure, or Nova/Rally) were very effective for controlling powdery mildew even when they were not applied until petal fall. However, as we have moved away from DMIs for scab control, mildew has become a more visible problem.

Powdery mildew overwinters in buds that became infected the previous summer, something that can happen only in orchards where mildew was not adequately controlled. Overwintering mildew is killed in varying proportions of infected buds as winter temperatures drop below 10°F, but suppression of mildew by winter cold is probably noticeable in commercial orchards only after temperatures drop below 0 or –5°F. However, 95 percent of infected buds can be winter killed when temperatures drop below –11°F because infected buds are weaker than healthy buds. The mildew in infected buds also dies when buds are winter killed. Thus, cold winters can suppress mildew in the colder parts of New York and New England, but our recent series of relatively warm winters have allowed good survival of mildew throughout most of this region.

Buds with overwintering mildew may begin growing a bit more slowly than healthy buds in spring, so the mildew signs on the surface of infected buds usually appear only after trees reach the tight cluster or pink stages. Flower clusters and shoots that develop from infected buds are called primary infections. The infected clusters or terminal leaves have a heavy white coating of mildew spores on most or all of the leaves. Leaves and flower buds are often distorted by the mildew (Figs. 1 and 2). Spores from the primary infections are blown to other newly unfolded leaves, where they can cause secondary infections (Fig. 3). New leaves are susceptible to mildew for only a few days as they unfold.

Most fungal spores require water for germination, but powdery mildew spores can germinate and infect tissue anytime that relative humidity is between 70 and 100 percent with temperatures...
between 50 and 80°F. Optimum infection conditions are 96 to 100 percent relative humidity and 68 to 72°F. Rain actually deters mildew by washing spores off of primary infections and by slowing spore germination.

Secondary mildew infections can also occur on the flower parts that later develop into fruit, and affected fruit will develop a net-like russetting (Fig. 4). Fruit infections can occur between tight cluster and 2nd cover, but at least one report from New Jersey showed that most fruit infections occurred at the pink bud stage. Fruit russetting caused by mildew can look very similar to russetting from other causes. In particular, copper residues from delayed dormant copper sprays applied to control fire blight can cause a mildew-like russetting on fruit in years when dry prebloom weather allows high levels of copper residues to persist in trees up through the pink bud stage. My own observations suggest that mildew-induced fruit russetting is relatively rare in New York, perhaps because most cultivars grown in New York are less prone to fruit infections than are cultivars such as Jonathan, Idared, and Rome Beauty, or perhaps because few orchards in New York ever develop the severe mildew infestations required to produce fruit infections.

Rubigan, Procure, and Rally (formerly sold as Nova) controlled mildew not only by protecting new foliage, but also by eradicating incubating infections before they could appear on leaves and by suppressing sporulation of older infections. These fungicides were so effective that they could even suppress sporulation on shoots with primary infections, although the fungus often survived in the symptomless tissue from overwintering infections and appeared later on leaves that developed after DMI sprays were discontinued (Fig. 5). Because of their post-infection and anti-sporulant activity, DMI fungicides provided effective control of powdery mildew in NY and New England, even when the first mildewcide spray was applied at petal fall. However, that situation is changing for several reasons.

Based on field observations, we suspect that powdery mildew populations in some orchards have shifted toward resistance to DMI fungicides. When Bayleton, a DMI fungicide that had no activity against scab, was introduced in the 1980s, it provided excellent control of powdery mildew when applied at 1.5 oz/A, whereas 20 years later, rates of 4 oz/A were reportedly required to produce similar levels of mildew control. Over the past five years, some observers also felt that Nova/Rally was no longer as effective against mildew as it had been when first introduced, but no one has demonstrated a control failure when Nova was used repeatedly at rates of 5–6 oz/A. However, mildew appeared unexpectedly in some western NY orchards last year where growers used Inspire Super in programs that, in earlier years, continued...
should have provided mildew control. As noted in an earlier article on scab fungicides, the 2nd generation DMIs (Inspire Super, Indar, Tebuzol) may be slightly less effective against mildew than the older DMIs, and these differences in fungicide capability presumably would be magnified in orchards where the mildew population is shifted toward DMI resistance.

Unfortunately, there is no easy way to assess fungicide resistance in powdery mildew because this pathogen is an obligate parasite that cannot be grown in culture. So far, no one has developed effective detached leaf assays for studying fungicide resistance in apple powdery mildew, and conducting trials with various mildew strains on potted greenhouse trees would be prohibitively expensive. For the foreseeable future, assumptions about fungicide resistance in apple powdery mildew will need to be based on field observations.

Given uncertainties about DMI resistance in powdery mildew, we probably need to adopt mildew control programs that are more conservative than in past years. The first step is to begin mildewcide applications before bloom. Where previous experience suggests that DMIs may be losing activity against mildew, mildewcide sprays should be initiated no later than the pink bud stage, and starting at tight cluster would be even better. I suspect that where DMIs are showing reduced activity against mildew, their post-infection activity will be compromised more rapidly than their protectant activity. If true, that provides further justification for starting mildew programs at tight cluster or pink, so as to avoid any need for post-infection applications. Finally, Flint, Sovran, and Cabrio will all provide excellent protection against mildew, but we know that they are less effective than DMIs for arresting mildew if the first mildewcide application is delayed until petal fall.

Growers who are depending primarily on mancozeb and/or captan sprays for scab control should be especially watchful for primary mildew infections because mancozeb and captan do not control mildew. Where a mildew problem is anticipated, sulfur at 3–5 lb/A can be added to the captan/mancozeb sprays starting at tight cluster. Alternatively, a DMI fungicide or a strobilurin fungicide (Flint, Sovran, Cabrio) can be used beginning at pink or bloom and the alternate chemistry can be applied at petal fall and first cover. Growers using mancozeb/captan programs often underestimate mildew until it explodes into secondary infections and becomes highly visible at about third cover. By that time, the battle is lost and there is a high probability that the orchard will again harbor mildew in many buds that will show up as primary infections in 2011.

Remember that mildew likes warm weather with no rain, so mildewcides are especially important during years with extended dry periods between tight cluster and 2nd cover. Mildewcide sprays should be continued until terminal bud set in young orchards that have not yet filled their spaces,
because young orchards will continue to produce new foliage conducive for mildew infections long after terminal growth has stopped in bearing orchards. Sulfur can be an inexpensive option for mildew control after first or second cover in both bearing and non-bearing orchards.

Regardless of what fungicide program is used, it is important to remember that primary mildew infections are virtually impossible to eradicate. Thus, in orchards where mildew was poorly controlled in 2009, one can still expect to find a few primary infections or “flag shoots” like those shown in Fig. 2, even if appropriate mildewicides are being applied in 2010. The objective of the current season mildew program is to minimize the spread of spores from these primary infections to new leaves where discrete secondary infections would otherwise appear after bloom (Fig. 3). Good mildew control in 2010 will minimize both current season damage to foliage and the number of infections that will carry over into 2011.

Some wild Prunus species can harbor black knots and produce spores that can blow into adjacent orchards. Chokecherry bushes (Prunus virginiana) are particularly susceptible. Hedgerows in the vicinity of new plantings should be scouted in late winter or spring, and any black knots in the hedgerows should also be removed and burned before the new planting is established.

The danger posed by leaving pruned-out black knots near an orchard became painfully evident in our own research plots last year. We had severely infected plum trees left from a recent fungicide trial, but we dutifully pruned out all of the knots before the start of the growing season. We dumped these knots in the corner of a woodlot about 50 feet away from an open field where we were planting new plum trees later that spring. Because we had removed the knots and presumably had no significant source of inoculum, I ignored early-season fungicide sprays in my new planting. My errors became apparent by September of last year when black knots started appearing in the new growth of the trees we had just planted. I erred twice, first by failing to burn the black knots and then by failing to protect my newly planted trees with chlorothalonil. Many of those trees had to be pruned back severely to get rid of the black knots, and the affected trees will now take an extra year to come into production.

Plum growers should remember that black knot can quickly devastate plum trees that are not protected with fungicides during the critical period between white bud and the second cover spray. The most effective fungicide is chlorothalonil (Bravo and generics), but fungicides alone will not provide adequate control if black knots from previous years are left in the trees. Thus, the first step in controlling black knot is to remove all visible knots during winter pruning. Knots that are pruned out of trees should be burned or composted well away from the orchard. Knots left on the ground or in orchard perimeters can still discharge spores that will be blown into orchards.

Black knot is caused by the fungus Apiospora morbosa, known also as Dibotryon morbosum. Asco- spores from the shiny black knots on trees (Fig. 1) are released during rain periods in spring and infect new growth.
on trees. Growing spurs can become infected, but most infections occur on growing terminal shoots. Some ascospores may be released soon after plum trees reach bud break, but most are released between white bud and one week after petal fall. There is no known secondary cycle for black knot, so the disease cannot spread after the supply of ascospores is exhausted in late spring or early summer.

Although infections occur during spring, they do not become evident until many weeks later. Sometimes infections develop into knots that can be recognized as such by September (Fig. 2). Those knots will turn black and produce ascospores the following year. In many cases, however, the only evidence of infection in autumn is a slight swelling of the twigs. Those swellings turn into recognizable knots the following growing season and then produce ascospores two years after the initial infections occurred. Individual knots produce spores for only one season, but tissue just below existing knots can erupt with new extensions of the original black knots, and that new tissue can produce knots the following year.

Plum cultivars vary in susceptibility to black knot. Most European plum varieties are quite susceptible, whereas Asian plums tend to be more resistant.

As noted earlier, chlorothalonil is far more effective against black knot than any other fungicide. Some chlorothalonil labels specify that sprays can be applied no closer than 10 days apart, but sprays applied at that interval will probably be adequate for protecting trees from black knot. Chlorothalonil cannot be used after shuck split, so it is important to utilize the shuck split application so as to provide extended protection against any black knot spores that might be released shortly after shuck split. In a recent study, we found that both Indar and Pristine, when applied during bloom to control brown rot, also suppressed black knot. However, these products were less effective than chlorothalonil.

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**PEST FOCUS**

Highland:  
**Pear psylla** oviposition increasing; nymphs observed. **Spotted tentiform leafminer**, **Oriental fruit moth**, and **red-banded leafroller** trap catches increasing.
### PHENOLOGIES

<table>
<thead>
<tr>
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<th>Geneva:</th>
<th>Highland:</th>
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<tbody>
<tr>
<td>Apple (McIntosh):</td>
<td>tight cluster 4/12</td>
<td>tight cluster – pink 4/19 (Predicted)</td>
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<tr>
<td>Apple (Red Delicious):</td>
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<tr>
<td>Apple (Empire):</td>
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<td>Pear:</td>
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### UPCOMING PEST EVENTS

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<th>50°F</th>
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<tr>
<td>(Geneva 1/1–4/12/2009):</td>
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<tr>
<td>(Geneva &quot;Normal&quot;):</td>
<td>104</td>
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<tr>
<td>(Geneva 1/1–4/19 predicted):</td>
<td>289</td>
<td>150</td>
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<tr>
<td>(Highland 3/1–4/12/10):</td>
<td>330</td>
<td>178</td>
</tr>
</tbody>
</table>

**Coming Events:**
- **Ranges (Normal ±StDev):**
  - Green fruitworm flight subsides: 246–456 ±111–241
  - Redbanded leafroller 1st flight peak: 231–367 ±104–188
  - Spotted tentiform leafminer 1st flight peak: 263–387 ±121–199
  - Oriental fruit moth 1st catch: 221–325 ±94–164
  - Comstock mealybug 1st gen. crawlers in pear: 215–441 ±80–254
  - European red mite egg hatch: 231–337 ±100–168
  - Rosy apple aphid nymphs present: 134–244 ±56–116
  - Rose leafhopper nymphs on multiflora rose: 239–397 ±96–198
  - Lesser appleworm 1st catch: 260–538 ±119–287
  - Obliquebanded leafroller larvae active: 158–314 ±64–160
  - Pear psylla 1st egg hatch: 174–328 ±60–166
  - McIntosh at pink: 274–312 ±124–158

**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.