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## **Apple Scab**

### **Postharvest urea canopy spray for scab inoculum reduction**

Research conducted by Sam (D.K.) Sutton, Dr. William MacHardy, and William Lord at University of New Hampshire demonstrated that overwintering scab inoculum could be reduced 50-70% by fall or spring (respectively) urea applications to fallen leaves to enhance natural leaf decomposition, and 80-90% with fall or spring flail mowing. The greatest reduction (97%) was achieved by applying urea to the leaves while still on the tree. The exact specification for this treatment is applying 40 lbs. of food grade urea fertilizer in 100 gallons of water per acre. This not only gave the best scab suppression, it eliminated the problem of having to wait until leaves fell before applying the treatment. In some years leaves don't fall until there is already snow on the ground, or leaves freeze to the ground shortly after falling.

But the drawback to canopy application was concern that late fall nitrogen application through urea could interfere with hardening off and make the trees more susceptible to winter injury. Subsequent research by Drs. James Schupp and Lailiang Cheng at Cornell's Hudson Valley lab found that as long as tissues were well matured, postharvest foliar urea canopy application did not compromise the cold hardiness of Marshall Mac and Empire apple trees, and had the benefit of helping to improve reserve N status of apple trees for spring growth the following year.

### **Delayed scab fungicide sprays in low inoculum blocks**

Dr. MacHardy's research on scab inoculum reduction was part of a larger effort to reduce the number of scab fungicide sprays in orchards with low scab inoculum. Research trials demonstrated that orchards that had documented low foliar scab level the previous fall (called PAD for "potential ascospore dose"), or which had a slightly higher level of apple scab infestation but which had then received inoculum reduction treatment (i.e. urea or leaf shredding), could safely delay scab fungicide protection until the fourth primary scab infection period or Pink the following spring. The research actually found that longer delays were successful, but this was chosen as a conservative protocol for commercial adoption.

But that protocol had two problems. One was that the fall scab assessment had to be done mid-September to early-October when growers are fully occupied with harvest. The second problem was that the protocol was based on data from orchards where only protectant fungicide (e.g. captan, mancozeb) had been used. There was concern that scab infections that had been suppressed but not completely killed might not be visible as lesions in the fall but could reactivate during the overwintering period and contribute inoculum for spring infections in orchards where DMI (aka sterol inhibitor; = Rally, Vintage, Procure, Indar, Inspire Super) or strobilurin (Flint, Sovran, Pristine) fungicides were used during the previous spring and summer.

The first concern (time required for fall scab indexing) has been addressed by definition of a sequential sampling protocol that effectively reduces the sample size required. A sample of 100 shoots and clusters per orchard is all that is required for most orchards. In a large (= more walking between trees) and clean orchard (where a full 100 shoot sample is required), the assessment takes 40 minutes or less. Orchards with above threshold scab infections take less time to check as it becomes apparent after only a few trees that the threshold will be exceeded. When an orchard's scab index falls into the intermediate zone, you can either take the time to increase the sample size to 200 shoots and hope for a definitive answer by comparing observations against the higher threshold and narrower intermediate zone for the larger sample size, or you can take the information from the 100 shoot sample and use it for what it is, an informative but indefinite result, or play it extra safe and just assume that any orchard that does not have a low enough number of scab-infected leaves to qualify from the initial 100 shoot sample does not qualify for a delayed spray program the following spring.

I think it's a win-win regardless of what you find. Finding out that a block has low enough scab to qualify for a delayed spray program the following spring has obvious advantage, but it is also valuable to identify and quantify which blocks have high scab. You would probably know that from casual observation, but it is also true that growers tend to judge scab level by the percent of fruit with scab lesions. Unfortunately this is known to be an unreliable indicator. A block with high level of foliar scab can yield fruit with little or no observable fruit scab. Seeing an objective rating of the foliar scab level can focus attention on finding the weak points in the scab suppression program and help prioritize which blocks get the most attention next spring.

The second problem of potential delayed scab expression has not been explicitly resolved, but Dr. Daniel Cooley at the University of Massachusetts has been empirically testing a shortened version of the delayed spray protocol in orchards where DMI and strobilurin fungicides have been regularly used. The revised version uses the same fall scab assessment and threshold, but if an orchard is identified as "low PAD", the delay the following spring is limited to skipping the first two scab infection periods, i.e. waiting until the third scab infection period, or until Tight Cluster, whichever comes first.

Dialing back from Pink to Tight cluster is a bigger change than might be immediately apparent. This is because scab ascospore maturity and the amount of susceptible leaf tissue changes greatly between Tight Cluster and Pink, with the result that potential scab infection risk can change by a factor of 4X (400%) in the week between Tight Cluster and Pink. The recent delayed spray research began with fall scab assessments in 2007 and has continued with delayed spray programs in qualifying blocks in 2008, 2009, and 2010. This update of the PAD-delayed spray research is ongoing, but so far there have been no problems in the delayed spray blocks, and in fact most have had lower scab levels than the no-delay blocks.

### **Scab inoculum status in 61 Maine apple blocks in fall 2010**

Results from scab assessments done in 61 Maine orchard blocks between September 14 and October 8, 2010 are shown in the table below this article. For each orchard the scab level is stated as infected leaves per 100 shoots and clusters, though for orchards with high scab the number shown is an extrapolation from a smaller sample size (you don't need to keep sampling once you've determined that the block will not qualify for a delayed spray program next spring).

Blocks that qualify for a delayed spray strategy (wait until the third primary scab infection period or Tight Cluster, whichever comes first) are shown in green.

Blocks that do not qualify for a delayed spray strategy, but ostensibly could do so **IF** (and only IF) scab sanitation such as on-tree urea application before leaf fall are shown in orange. I say “ostensibly”, because according to the statistical protocol devised by Dr. MacHardy et al., a block that does not qualify by the first 100 shoots, should be sampled for another 100 shoots before making a decision about qualifying for a delayed spray program.

So I’m bending the protocol just a tad in labeling those sites as candidates for a delayed spray program if scab sanitation is applied, but I’m doing so with multiple layers of caution. The research behind the original delay program was conservative, in other words even longer delays were tested and found to provide effective scab control. The shorter delay in the revised protocol is considerably more conservative for the reasons noted above. The thresholds for defining a low scab block were devised for the original longer delay. The 100 shoot values in orange are well below half of the 200 shoot thresholds (24-28 infected leaves) in the original protocol. Also, on tree urea application has been shown to be considerably more effective at reducing overwintered scab inoculum than the techniques (flail mowing leaves, ground application of urea) factored into the original thresholds. And finally, I know that I was very cautious in calling anything that *might* have been active scab as being scab in doing the sampling. If one of your blocks is in this category, you can judge for yourself, or give me a call and we can talk it over.

Blocks in the queasy middle about whether they qualify for a spray delay **IF** scab inoculum reduction is used are shown in black. The best bet there is to play it safe and not use a delayed spray program next season.

Blocks with too much scab to consider a delayed spray program next spring are shown in red. A separate email is being sent to each grower with blocks represented below to let them know which of their blocks the codes refer to.

## **Summary**

The good news is that 2010 was an easy year for scab control. Of the 61 blocks sampled, almost half (29) directly qualify for use of a “3<sup>rd</sup> infection period / Tight Cluster” delay next spring. And another 11 blocks qualify if scab inoculum reduction treatment is made before next spring. Thus, a delayed scab spray program next spring is worth considering in two thirds of the sampled blocks.

In my opinion this is a safe recommendation, but it is incumbent upon me to remind you that the “wait until third infection period / Tight Cluster protocol in low inoculum blocks” protocol described here is still in testing. As with any new practice, careful implementation is required. It is also important to point out that delaying the first scab fungicide until it matters requires that the first application be made with accurate dosage, good coverage and proper timing. The obvious disadvantage of applying fungicide before you really need it is wasted cost. But those early sprays also provide some insurance by building up a base residue of fungicide protection, some of which is probably still around to help compensate for incomplete coverage and provide some additional protection when it is actually needed. Also, those early sprays also serve as practice runs to adjust coverage and calibration issues. By waiting until it really matters to start scab protection, when you do start it really matters that effective protection is applied.

If you have one or more blocks that qualify for skipping a couple of early season scab sprays, you can apply copper at quarter inch green for its nutritional and fire blight suppression qualities, and then take advantage of the delayed scab spray program until the third infection period 3 or Tight Cluster. The copper spray also acts as a protectant scab fungicide protectant, and making that application will provide a chance to insure that spraying system is working properly. In that case you will probably only really be skipping one scab fungicide application, but that's still saving you from the fungicide, fuel, labor, and mud rutting cost for a full-block early season spray application. A penny saved is a penny earned. Saving a few hundred dollars is even better.

Block ID code	Number of scab-infected Leaves per 100 shoots
A	0
B	0
C1	0
C2	0
D	0
E1	0
F1	0
F2	0
G1	0
G2	0
H1	0
BB1	0
J1	0
H3	1
K1	1
Y	1
L1	1
M	1
N1	1
O	2
H2	2
N2	2
O	3
N3	3
P1	4

Block ID code	Number of scab-infected Leaves per 100 shoots
E2	5
Q1	5
P2	5
L2	5
BB2	6
R	6
S1	6
T1	7
U1	8
U2	8
U3	8
N4	8
N5	9
P3	9
V1	9
K2	12
T2	14
F3	15

Block ID code	Number of scab-infected Leaves per 100 shoots
S2	25
V3	28
X1	32
F4	37
Z	39
U4	42
F5	43
X2	47
P4	55
AA1	57
AA2	58
W2	80
J2	97
E3	100
P5	135
Q2	176
W3	345

Cheng, L. and J. R. Schupp. *Nitrogen Fertilization of Apple Orchards*. 2004. New York Fruit Quarterly, 12(1): 22-25. <http://www.nyshs.org/pdf/2004-Volume-12/Vol-12-No-1/Nitrogen-Fertilization-of-Apple-Orchards.pdf>

Cooley, D. R. and A. F. Tuttle. 2007. *Preliminary Observations in Blocks Using PAD to Delay the First Apple Scab Fungicide Spray*. Fruit Notes 72(3): 9–12. <http://www.umass.edu/fruitadvisor/fruitnotes/v72n4/a5.pdf>

MacHardy, W. E., Berkett, L. P., Neefus, C. D., Gotlieb, A. R., and Sutton, D. K. 1999. An autumn foliar scab sequential sampling technique to predict the level of “scab-risk” next spring. (Abstr.) *Phytopathology* 89:S47.

Schupp, J., L. Cheng, W. C. Stiles, E. Stover and K. Iungerman. 2001. *Mineral nutrition as a factor in cold tolerance of apple trees*. *New York Fruit Quarterly* 9(3): 17-20.

<http://www.nyshs.org/pdf/2001-Volume-9/Vol-9-No-3/Mineral-Nutrition-as-a-Factor-in-Cold-Tolerance-of-Apple-Trees.pdf>

Sutton, D. K., MacHardy, W. E. and Lord, W. G. 2000. *Effects of shredding or treating apple leaf litter with urea on ascospore dose of Venturia inaequalis and disease buildup*. *Plant Dis.* 84:1319-1326. <http://apsjournals.apsnet.org/doi/pdf/10.1094/PDIS.2000.84.12.1319>

## Voles

Meadow voles require heavy grass and broadleaf cover and growing, green vegetation to breed. Regular close mowing of orchard alleys and use of an herbicide strip beneath trees can effectively prevent meadow voles from establishing residence, eliminate the risk of winter feeding damage, and thus replace need to use rodenticide. Mowing removes protective cover and food sources, and exposes voles to predation and weather stress. Eliminating brush piles and non-mowed wet areas near orchards also helps.

With multiple generations per year, meadow vole populations can increase rapidly in orchards with unmowed vegetation. Resident voles damage trees by feeding on lower trunks. Most damage occurs in winter when other food sources become scarce. Young trees that still have smooth bark are at greater risk than trees with rough bark. Orchard studies on meadow and pine vole infestations in Washington and New York found yield reductions of 35– 65%, and more important, significant tree mortality.

Vole girdling can be differentiated from girdling by other animals by the non-uniform gnaw marks at various angles and in irregular patches. Vole gnaw marks are about 1/8 inch wide, 3/8 inch long, and 1/16 inch or more deep. Rabbit gnaw marks are larger and not distinct, and I don't know that rabbits have ever been a problem in Maine orchards. Porcupines do feed in Maine orchards, and while they can feed on trunks, they tend to feed up in the tree on smaller branches. Deer rubbing removes large sections of bark and is usually higher on the trunk than vole damage.

For additional protection, lower trunks of young trees should be protected by hardware cloth or plastic trunk guards with a mesh size < 1/4 inch. The guards should extend above the expected snow line, and be buried into the ground on the lower end. Mulch should be removed to at least 3 feet from the bases of trees.

In orchards where a meadow vole population is present, a postharvest broadcast application of zinc phosphide treated vole bait into orchard alleys is recommended. Zinc phosphide is highly toxic to voles and a single feeding will kill them. It is also toxic to humans and is a restricted-use pesticide that can only be purchased by licensed pesticide applicators. It is used as a single broadcast application at 6–10 pounds per acre, preferably after a close mowing and at the start of

a period of at least 3 days of fair weather. Rain on the first or second day after spreading vole bait reduces consumption and degrades the zinc phosphide before it can be consumed.

Avoid distributing vole bait onto bare ground, including vegetation-free strips under trees, because exposed bait is more likely to be taken up by song birds, turkeys, and other nontarget species. Bait is typically distributed by a granular spreader, but in small plantings can also be spread a tablespoon at a time by hand being sure to use rubber gloves for protection. Bait stations under every tree (for large trees) on the orchard perimeter can be a practical way to augment broadcast application, keeping within the limited of total bait per acre. A bait station can be made from sections of 1.5 inch-diameter PVC pipe, or 15" square shingles, boards, etc. Shingles or boards need to be placed at least two months prior to fall baiting to lure voles into tunneling under them. In the fall, place 2.5 ounces of zinc phosphide pieces in/under each station. The bait stations not only work to focus vole activity at a specific spot, they also keep the bait dry and active for a longer period, and away from nontarget species.

Anti-coagulant baits containing the active ingredient diphacinone (Ramik Brown) or chlorophacinone (Rozol) are also registered as restricted-use, agricultural rodenticides in Maine. These products are less preferable than zinc phosphide because they require multiple feedings to be effective, and are slower acting, taking 1–2 weeks to take effect. A second application 1-2 months after the first may be needed.

Repellents based on capsaicin (the active ingredient in hot pepper formulation) will provide short term protection at best and are not recommended for orchard use. Fumigants are neither effective nor registered for meadow vole control in orchards. Trapping is too time consuming to be an effective alternative.

Because pine voles primarily live below ground, mowing and ground cover management is not as effective against pine voles. If needed, pine vole control requires placement of bait under bait stations or directly into tunnels. Pine voles occur in NH and VT, but are not known to be present in Maine orchards, with the possible exception of extreme southern Maine.

## Upcoming Events

**Maine State Pomological Society meeting** at the Maine Agricultural Trade Show, January 12, 2011. 10am - ?.

**Apple IPM Update**, Wed. January 12 at 9am, and other pesticide applicator recertification credit sessions at the Maine Ag Trade Show, January 11-13.

**Preseason Apple Grower Meeting, March 16, 2011** at Highmoor Farm, 9am to 3pm. Jon Clements, Extension Educator at the UMass Cold Spring Orchard Research & Education Center will give two presentations, a travelogue about high density tree fruit plantings he has visited around the world and the latest techniques for high density plantings.

**“Sometime this winter”** – Maine Legislature Ag Committee will be reconsidering the aerial spray notification requirements based on experience with the temporary regulations in place for 2010.

## Other News

Excerpts from the October 22, 2010 issue of “The Packer” produce industry magazine article titled “*United Fresh meets with federal officials on residue worries*”.

“In response to negative media coverage concerning pesticide residues on fresh fruits and vegetables, the fresh produce industry is asking the government to pitch in by making it clearer that reports from federal agencies stress there’s no risk to consumers from the traces of residue. United Fresh Produce Association representatives met with officials from the U.S. Department of Agriculture, the Environmental Protection Agency and the Food and Drug Administration Oct. 19 in the first step of an ongoing dialogue. The goal is to make government data less prone to misuse by consumer groups that raise alarm about pesticide residues.”

The article contains the following statements by Ray Gilmer, vice president of communications for the Washington, D.C.-based United Fresh Produce:

- The big push has always been to get the EPA and the other agencies more engaged in defending the registration process.

- The ‘Dirty Dozen’ list comes out from the Environmental Working Group, and a bunch of news outlets run it and it raises doubts in the minds of consumers about the safety of fresh produce.

- It was a very frank discussion about how this kind of mischaracterization of the USDA Pesticide Data Program (PDP) data can lead to consumers eating fewer fruits and vegetables, which is clearly against the mandate of USDA. All the parties in the room said absolutely that the PDP data shows there is no risk associated with the consumption of fresh produce due to pesticide residues.

- Representatives from the EPA, FDA and USDA said they generally haven’t received a lot of media inquiries about the so-called ‘Dirty Dozen’. They felt like they weren’t really engaged in the conversation.

- Federal officials agreed on the need to defend the pesticide registration process so it is not hijacked by activists groups with other agendas, and seemed open to clarify the PDP and make sure the reports can’t be misinterpreted or twisted make people doubt the safety of produce.

- Industry would like to see the PDP report convey that message while still conveying all the detail they always have.

<http://thepacker.com/United-Fresh-meets-with-federal-officials-on-residue-worries/Article.aspx?oid=1275945&tid=&fid=PACKER-TOP-STORIES>

## Closing Words

“Perhaps they are not stars, but rather openings in heaven where the love of our lost ones pours through and shines down upon us to let us know they are happy.”

- Eskimo Proverb

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