scaffolds

Update on Pest Management and Crop Development

FRUIT JOURNAL

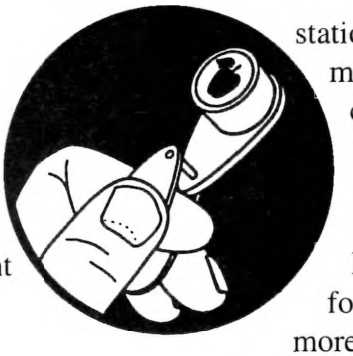
April 16, 2001 | VOLUME 10, No. 5 | Geneva, NY

DISEASES

IS IT SOUP YET?

ASSESSING ASCOSPORE MATURITY OF *VENTURIA INEQUALIS*

(Dave Rosenberger, Plant Pathology, Highland)



❖❖ Ascospore maturity assessments have been used for many years to predict the beginning of the apple scab season. In most years, mature ascospores of *V. inaequalis* are present and ready to be released soon after apple trees reach the green tip bud stage. However, in some years ascospore maturity is delayed compared to apple bud phenology. When that occurs, apple growers can omit one or more early season fungicide sprays with minimal risk of developing apple scab. Conversely, in years when ascospore maturity is advanced compared to apple bud phenology, early season sprays for apple scab may prove essential for controlling scab. Ascospore maturity assessments provide growers with one predictor for differentiating high versus low risk for early season scab infections. As noted toward the end of this article, there are numerous other factors that contribute to severity of apple scab in any given year.

For the 2001 season, the New York State IPM program is funding early season ascospore maturity counts for all of the major apple production regions in New York. Ascospore maturity counts have been conducted continuously in eastern New York for many years, but maturity counts in other regions were discontinued several years ago when the technician who performed the counts at the Geneva Experiment station retired. Conducting ascospore maturity assessments is a tedious process. Skilled and experienced observers produce more consistent results than novices. Fritz Meyer, a plant pathology technician at the Hudson Valley Lab, has been performing squash mount assessments for more than 25 years and will be performing all of the IPM-funded counts for New York State in 2001.

Assessments are done by picking 20 pseudothecia (the small fruiting structures) out of overwintering leaves and squashing them on microscope slides. Pseudothecia usually contain anywhere from 80–150 asci. Asci are transparent cylindrical sacs that each contain eight as-

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cospores. The ascospores are clear when immature, but turn an olive-green color as they mature. Maturity assessments are conducted by observing the squash mounts at 400X magnification and counting the number of asci that have clear spores (immature), colored spores (mature), or no spores. Asci in the latter category must be further differentiated between closed asci, which means the asci are so immature that no spores have yet formed, and empty asci from which spores have already been discharged.

In microscopic assessments, squashed pseudothecia appear as a jumble of overlapping asci. The technician conducting the counts must visually scan the field of view in the microscope while clicking off on a counter the maturity category for each ascus that is observed. There is no way to "mark" the asci already counted, so the observer must mentally track which asci have already been counted. The process is somewhat analogous to trying to count the number of branches in a small brush pile without touching any of the branches. Consistency in scanning and enumerating the asci as seen through the microscope is critical for generating useful squash mount information.

The tower shooting test (or ascospore discharge test) is usually conducted at the same time as squash mount assessments and provides an independent evaluation of spore maturity. In the tower shoot test, leaves are wetted and placed on a screen about 16 inches above a plenum through which air is drawn by a vacuum pump. Spores discharged from the wet leaves are trapped on greased slides just below the holes in the plenum. Counting the number of spores trapped provides an estimate of whether or not leaves are actually discharging spores. However, these counts are of limited utility for several reasons. First, there is no quantitative way to assess how many pseudothecia are present in the leaves used for the tower shoot. A sample of heavily scabbed leaves will always produce more spores than a sample of lightly scabbed leaves, so there is no way to establish an action threshold using tower shoot counts. With moderately scabby leaves, counts in the tower shoot as we conduct them at the Hudson Valley Lab must usually exceed 40–50 spores before significant infections can be expected in commercial orchards. However, that threshold is very much a "fuzzy logic" rule of thumb. Another problem with tower shoot counts is that leaf samples collected during or shortly after a rain will discharge relatively few spores in the tower because all mature spores will have been released during the rain. For these reasons, we use the tower shoot only as a supplement to squash mount assessments.

An alternative approach for assessing ascospores involves a degree-day model that was developed by Drs. David Gadoury and Bill MacHardy (1982). Using this model, degree-day accumulations are initiated when 50% of McIntosh fruit buds are at green tip. The model is useful for predicting the period of peak ascospore discharge and the end of the ascospore production season. However, reliability of the model for predicting spore maturity during the first week or two after green tip is questionable. The model uses the green tip bud stage as a biofix, so it cannot compensate for years when

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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
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This newsletter available on CENET at: news://newsstand.cce.cornell.edu/cce.ag.tree-fruit
and on the World Wide Web at:
http://www.nysaes.cornell.edu/ent/scaffolds/
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ascospore maturity is unusually advanced at the time that trees reach the green tip bud stage. Because years with advanced spore maturity pose the greatest scab risks for apple growers, we decided to initiate statewide squash mount assessments in 2001.

Ascospore maturity is only one of many factors that determine when and where apple scab will cause commercial problems. The amount of overwintering inoculum in an orchard is far more important than relative maturity of ascospores during any given infection period. If ascospore production and release is compared to water flow through a hose, then the amount of overwintering inoculum could be compared to the size of the hose and relative maturity of ascospores could be compared to the time that the valve feeding the hose is turned on. Obviously, the volume coming from a 3-inch fire hose (i.e., a high inoculum orchard) will be much greater than the volume from a half-inch garden hose (i.e., a low-inoculum orchard). Furthermore, spore concentrations will reach economic thresholds earlier in the season in high inoculum than in low inoculum orchards, just as a 3-inch hose can deliver 100 gal of water more quickly than a half-inch hose when both hoses are activated at the same time. Thus, growers with high-inoculum orchards must always be more conservative with early season sprays (i.e., start earlier and keep tighter prebloom spray intervals) than growers with low-inoculum orchards.

Other factors that affect scab severity in any given year include the timing of the first rains that produce an infection period, the weather during bloom and petal fall, and weather during the early part of summer. The timing of rains during the prebloom period may be the most critical determinant in scab development because every day of dry weather after bud break delays scab development in trees by one more day. In years when no infection periods occur prior to tight cluster or pink, scab is often easy to control, even in high-inoculum orchards, because the earliest primary infections occur too late in the season to allow multiple cycles of secondary inoculum before fruit begin to lose susceptibility to scab. Dry weather during bloom and petal fall can similarly delay secondary infections and decrease the number of scab cycles that occur in a year. Hot, dry weather during early summer reduces viability of conidia and speeds terminal bud set on trees. Older leaves are relatively resistant to scab until autumn, so scab epidemics usually end when terminal buds are set.

None of the factors in the preceding paragraph are predictable when growers must make decisions about spraying fungicides at green tip. The squash mount assessments of spore maturity, coupled with a grower's or fieldman's assessment of inoculum levels in the orchard, provide the only two parameters for assessing potential risks of early season scab infections. The wet summer last year contributed to high levels of carry-over inoculum, and scab counts completed to date show scab maturity is ahead of tree phenology compared with an average year. Thus, this may not be a good year to gamble on omitting early season scab sprays.

Literature Cited

Gadoury, D. M., and MacHardy, W. E. 1982. A model to estimate the maturity of ascospores of *Venturia inaequalis*. Phytopathology 72:901-904.

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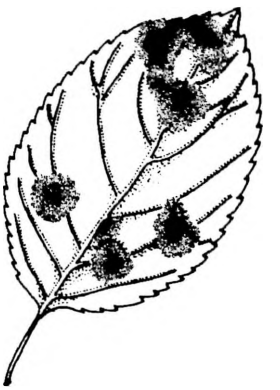

FIELD NOTES

HUDSON VALLEY

HUDSON VALLEY APPLE SCAB

Apple Scab Ascospore Maturity Counts:

Date	% ascospores that were Imm.	Mature	Empty	No. spores in tower shoot
Saratoga Co.				
April 9	94	6	0	0
Orleans Co.				
April 11	76	24	0	3
Highland				
April 11	76	23	<1	no data
April 16	--------no data-------			172

Bud stage: Quarter-inch green on Macs

❖❖ Commercially significant spore releases usually begin soon after our counts show 15% mature spores. The spore counts shown above are consistent with the conclusion drawn from the Hudson Valley count reported last week: Spore maturity is advanced this year compared to tree phenology. Spores from Saratoga County were not yet ready to discharge on April 9, but trees in that area were not yet at green tip at that time. (Kevin Iungerman reports that they are at green tip in Saratoga County as of today, April 16). The low number of spores in the tower shooting test for the Orleans Co. location indicates that most of the "mature" or colored spores observed in that squash mount evaluation were not quite ready to discharge. However, a day or two of warm weather is often enough to change "mature" but non-discharging spores into spores that will discharge with the next rain. The April 16 tower-shoot counts for Highland show that large numbers of ascospores are ready to go with the next rain in the Hudson Valley. Given the advanced levels of spore maturity evident in all the counts completed to date, I would advise that early infection periods will pose a greater-than-average risk of significant scab infection this year.❖❖

GENEVA

APPLE SCAB WARNING

(Bill Turechek, Plant Pathology, Geneva)

❖❖ On your mark... GO! Apple scab ascospore maturity counts are sufficiently high to suggest primary-scab inoculum will be plentiful at green tip. There is little time to 'get set'. Growers should be prepared to apply a protectant fungicide (i.e., copper, mancozeb, Polyram, captan) at green tip. This is especially critical for those orchard blocks that have had appreciable scab in the past few years. Copper is recommended at green tip in orchard blocks with a history of fire blight (see Dave Rosenberger's article in Scaffolds Vol. 10, No. 2). The first half of the week of April 16th is forecast to be cool and wet. It will dry out toward the latter half, providing suitable conditions for your green tip application.❖❖

INSECTS

PEAR PESTS

DAMIDGE CONTROL

(Art Agnello, Entomology, Geneva)

Pear Midge

❖❖ The pear midge is an old pest not commonly seen in blocks under a "standard" spray schedule. This insect is usually controlled by chemical applications for other pests, and in most cases of fruit infestation (whether commercial or homeowner), the problem comes down to the proper timing of an insecticide spray. The pear midge overwinters as a pupa in the soil, and the adults emerge in the lake plains area of N.Y. in early May. The first flies will generally appear when Bartletts and Clapps are in the swollen bud to tight cluster bud stage, but no successful egg-laying occurs until the flower buds are a little more developed.

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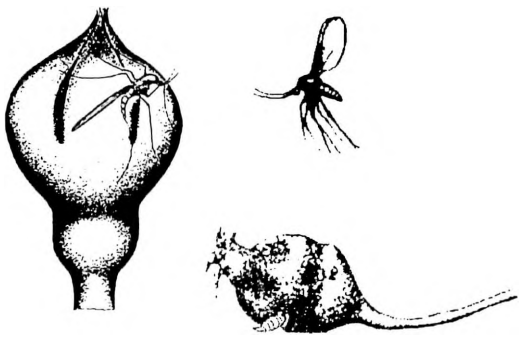

The critical period for chemical control begins when the sepals have spread apart enough to show the first appearance of pink (the folded petals underneath), and continues until just before most of the blossoms are open. [A call from an attentive pear grower last week noted that our guidelines for application given in the Recommends (p. 136) may be a bit 'behind the game', in that pear midge control is not mentioned until green cluster, by which time much of the egg-laying may have already occurred. So, to be safe, it is probably best to think about spraying by the late bud burst stage (p. 133, Fig. 3) in order to catch the emergence at the proper time.]

The flies disappear by the time of Bartlett full bloom. Larvae may be present inside the fruitlets on the tree, and do not affect fruitlet color. Full-grown larvae may leave the fruit or remain inside until it drops to the ground. In June and July, the maggots exit from the fruit (on the tree or the ground) and burrow into the soil as much as 3 inches to pupate later.

We know of no practice, either chemical or cultural (such as roto-tilling), that is effective enough to recommend for controlling the insects in the ground. These insects emerge in very large numbers, especially in a block continuously infested from year to year, and it is much easier to protect the fruit than to eliminate the pests at their source. If your pear block has a history of midge infestation and you wish to limit the area requiring chemical sprays, concentrate on those portions of the orchard most protected from the wind by trees, high ground, or buildings, as the midges tend to be most numerous in these spots. The most effective materials to use for midge sprays are organophosphates like azinphos-methyl; at least 2 sprays are recommended, one at first separation of the sepals, and one 7 days later (or at white bud, whichever comes first).

Pear Psylla

Originally introduced accidentally from England into Connecticut about 1832, the pear psylla has 3–4 generations a year, depending on the length of the growing season for the area. The overwintering adults pass the winter in litter on the ground or in cracks in the tree bark. On warm spring days, prior to the trees breaking dormancy, these adults can be found on the trunks, twigs, and branches. The first eggs in the spring are laid prior to bud burst, on the terminals and spurs. As the foliage appears and for succeeding generations, the eggs are laid on the new leaves. First egg hatch occurs about the time the foliage appears. The pear psylla is a "flush feeder", meaning that the nymphs feed and develop primarily on the newer, more tender growth. By midway through the growing season, the majority of leaves are hardened off and psylla development then may be limited primarily to the water sprouts.

Once the nymph begins to feed, a honeydew drop forms over the insect; the psylla develops within this drop for the first few instars. Honeydew injury occurs when excess honeydew drips onto and congregates on lower leaves and fruit. Under bright sunlight and dry conditions, the honeydew can kill the leaf tissue and produce a symptom called "psylla scorch". The honeydew is a good medium for sooty mold growth. When it occurs on the fruit, it russets the skin and makes the fruit unsaleable. Excessive feeding and the injection of toxic saliva by large populations of psylla can cause a tree to wilt and lose its leaves prematurely. This reduces tree vigor, which can take the tree several years to recover.

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Ladybird beetles, lacewings, syrphids, snakeflies, and predatory bugs have been recorded feeding on the psylla. There are also two wasp parasitoids of pear psylla in the U.S. However, to obtain commercially acceptable fruit in New York, pear psylla must be controlled with insecticides.

Registered insecticides for summer use on pears are historically unreliable in controlling pear psylla because of the development of resistance in psylla populations to materials that were once effective. In addition, N.Y. growing conditions necessitate management practices for fruit size attainment (vigorous fertilization and significant canopy pruning) that are favorable for the rapid buildup of psylla populations. Contributing to this situation of incomplete control is the widespread use of materials for other pests that are highly destructive to natural control agents, such as pyrethroids and carbamates.

Current management recommendations call for prebloom oil applications and insecticide sprays to manage nymphal populations that build beyond 1–2 per leaf, starting anytime after petal fall and throughout the summer. Newly registered Esteem at white bud or after petal fall has shown good activity in suppressing psylla numbers. Agri-Mek used shortly after petal fall has given good control if applied correctly (well-timed, adequate coverage, combined with an oil adjuvant), and Dick Straub's trials in the Hudson Valley have shown the utility of split applications of Pryamite or Provado, also starting soon after petal fall. In some orchards, Mitac retains its effectiveness as the standard rescue material during the summer, although its usefulness has been decreasing as local populations develop tolerance or resistance.❖❖

PEARDON ME

PEAR-RATUM

ERRATA

❖❖ An error (only one?) has been found in the Recommends that we would like to correct: Table 50 (p. 193) lists a 7-day PHI for Nova on pears. However, this material is not labeled for use on pears, so the correct entry should in fact be a 'dash'.❖❖

❖❖ The New York State Integrated Pest Management Program(Cornell University) has substantially improved its website, which now has a simpler URL: www.nysipm.cornell.edu. There are many links, free publications, and an abundance of information about agricultural pests and those that affect schools, homes, and municipalities. The new *Catalog of IPM Resources* and staff directory can be found on the website.❖❖

PEST FOCUS

Geneva:
Pear psylla eggs observed 4/12.

Highland: 1st **redbanded leafroller** and **spotted tentiform leafminer** caught today (4/16). **Pear psylla** egg count at 1 per bud.

UPCOMING PEST EVENTS

	43°F	50°F
Current DD accumulations (Geneva 1/1–4/16):	88	37
(Geneva 1/1-4/16/2000):	210	86
(Geneva 1/1–4/16 "Normal"):	138	59

Coming Events:	**Ranges:**	
Green fruitworm flight peak	64–255	19–108
Spotted tentiform leafminer 1st catch	73–433	17–251
Redbanded leafroller 1st catch	32–480	5–251
McIntosh at green tip	24–165	4–74

PHENOLOGIES

Geneva:
Apple (McIntosh): green tip
Apple (Red Delicious): silver tip
Peach: early bud burst
Pear: swollen bud
Sweet cherry: swollen bud
Tart cherry: swollen bud
Plum:bud burst

Highland:
Apple (McIntosh): quarter inch green
Pear: swollen bud

INSECT TRAP CATCHES (Number/Trap/Day)

Geneva, NY

	4/9	4/12	4/16
Green fruitworm	0.7*	0	0.1
Redbanded leafroller	0	0	0
Spotted tentiform leafminer	0	0	0

Highland, NY

	4/9	4/16
Green fruitworm	0.8	1.1
Redbanded leafroller	0	0.2*
Spotted tentiform leafminer	0	0.1*
Pear psylla eggs (per 100 buds)	14	100

* first catch

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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.