scaffolds
FRUIT JOURNAL

Update on Pest Management and Crop Development

July 23, 2007 VOLUME 16, No. 19 Geneva, NY

INSECTS

LOW FLYERS

ORCHARD RADAR DIGEST

Oriental Fruit Moth

2nd generation second treatment date, if needed: July 18.

Spotted Tentiform Leafminer

Third optimized sample date for 2nd generation sap-feeding mines, if needed: July 27.

Geneva Predictions:

Roundheaded Appletree Borer and Dogwood Borer

RAB peak egg hatch roughly: July 5 to July 25.
DWB peak egg hatch roughtly: July 28.

Codling Moth

Codling moth development as of July 23: 2nd generation adult emergence at 29% and 2nd generation egg hatch at 4%.
2nd generation 7% CM egg hatch: July 25 (= target date for first spray where multiple sprays needed to control 2nd generation CM).

IN THIS ISSUE...

IT ADDS UP

MODEL BUILDING

Insect model degree day accumulations:

Codling Moth (Treatment period for the 2nd generation starts at 1260 DD base 50°F after biofix):

Location	Biofix	DD (as of 7/23)
Highland	May 14	1244
Geneva	May 17	1150
Sodus	May 17	1018
Ithaca	May 24	928
Lansing	May 24	1081
Albion	May 25	1151
Williamson	May 25	1056
Appleton (South)	May 25	1121
Appleton (North)	May 25	1071
Waterport	May 28	1157

Obliquebanded Leafroller (% estimated egg hatch in DD base 43°F after biofix: 90% hatch – 810 DD; 100% hatch – 950 DD):

Location	Biofix	DD (as of 7/23)
Ithaca	6/11	917

(All other locations past 100% hatch point).

[NOTE: Consult our mini expert system for arthropod pest management, the Apple Pest Degree Day Calculator:
http://www.nysaes.cornell.edu/ipm/specware/newa/appledd.php
Find accumulated degree days between dates with the Degree Day Calculator:
http://www.nysaes.cornell.edu/ipm/specware/newa/
Powered by the NYS IPM Program's NEWA weather data and the Baskerville-Emin formula]

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HOT SPOTS

SUMMER DISEASES (Dan Cooley, University of Massachusetts) [Reprinted from *Healthy Fruit* 15(13), 17 July 2007 with edits for NY conditions by Dave Rosenberger.]

DISEASES

❖❖ [For those of you too busy, too hot or just plain not interested in what goes into our advice on when to spray for summer diseases, just know that it's now time. Apply summer sprays, keep track of the time and rain, and reapply as necessary according to Table 1.

For the first summer spray, the most effective fungicide is a Topsin-M plus captan combination. If this can't be used, use either Flint, Sovran, or Pristine to get eradication of any infections that may have started. Thereafter, captan alone at appropriate intervals is sufficient [although the Flint, Sovran, Pristine, or Topsin plus Captan all provide better residual protection and are preferred where disease pressure is high. –DR]

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Table 1. Fungicides for management of sooty blotch and flyspeck. Protection is gone when either the days of protection or amount of rain necessary for wash off, whichever comes first, have been met. (Based on tests by D. Rosenberger)

Treatment (rate/100 gal.)	Days of protection	Rain (in.) to wash off
Topsin M 70WP or WSP (3 to 5 oz) + Captan 50 WP (1 lb)	21	2
Flint 50 WDG (.67–.8 oz)	21	2
Sovran 50 WG (1–1.6 oz)	21	2
Pristine (5 oz)	21	2
Captan 50 WP (2 lb)	14	2
Ziram 76 WP (1.5 lb)	14	2
Captan 50 WP (1 lb)	10	1.5
Ziram 76 WP (1 lb)	10	1.5

Through June, the risk of sooty blotch/flyspeck (SBFS) infection was low.
It takes some time for the inoculum to develop in the trees and bushes around orchards. Then once it is released and lands on apples, it takes some time to develop into visible "specks".

I'm being deliberately vague about times because there's some disagreement on how much time it takes to develop inoculum and symptoms. Basically, plant pathologists agree that the flyspeck fungus grows only when plant surfaces are wet. However, we haven't settled on when to start counting the leaf wet hours, whether to count all leaf wet hours, and just how many leaf wet hours must be accumulated before fungicide treatments should start.

That's largely because sooty blotch and flyspeck are stealth pathogens. In flyspeck, the "specks" are actually the first stage of the fungus trying to form ascospores for the next year. Before the specks form, the fungus still grows, and produces lots of another kind of spore, conidia, but we can't see it doing that. It's only after a considerable amount of fungal growth and spore production, including movement from reservoir hosts on orchard borders, that the fungus finally forms visible structures. The rest of the time, for practical purposes, it's invisible.

Researchers at North Carolina State University decided that the best way to start to get a handle on a better way to manage SBFS was to see if they could predict the first appearance of symptoms using weather information. From 1987 to 1994, they collected weather data and noted when the first SBFS symptoms appeared on apples. Based on this, they determined that it took 273 hrs of leaf wetness for the first SBFS symptoms to show on apples, counting only wetting that was 4 hours or longer, accumulated from the first rain to occur 10 days after petal fall (LWHA, 4 hr. min, 10 days). There wasn't a real biological explanation about why this worked. But they theorized that the fungi were probably growing invisibly on fruit up to the point that 273 LWHA accumulated, at which point they formed visible symptoms. Based on this, they recommended that growers put on Benlate or Topsin M at about 220 hours, a little before symptoms were predicted to appear. Benlate and Topsin M were the most effective materials available, and assumed to have eradicant activity against SBFS fungi, much as they did against scab. After this initial application, they recommended regular fungicide applications at roughly 2-week intervals through the rest of the season. This saved a spray or two from a little after petal fall until the 220 hours wetness had accumulated.

Later work in Kentucky simplified the model, and counted all wetting periods, not just the ones that were longer than four hours. This research used paper bags to protect fruit from SBFS, and compared the bags with fungicide. They concluded that it took from 185 to 251 hours of wetting, with no minimum on the wetting, before SBFS symptoms appeared. If fruit were bagged, or sprayed with Topsin M, at 175 wet hours starting at 10 days after petal fall, they stayed free of SBFS. There was no reason to think that bags would eradicate

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existing infections on the apples, so it appeared that the Topsin M was most likely working as a protectant fungicide, without eradicating invisible infections. Ultimately, this Hartman/Sutton model has become the most widely used forecast tool. It has worked throughout the upper Midwest and in the Mid-Atlantic, and it is used by Spectrum Technologies.

Cornell used a somewhat different approach for several years. As we did at UMass, they concluded that the last scab sprays should offer some protection against SBFS. Dave Rosenberger's trials indicated that the amount of protection that was provided by different fungicides ranged from 10 to 21 days, or from 1 to 2 inches of rain (see Table 1, above). So, the last fungicide application targeting scab would generally be applied during the first week to 10 days after petal fall, and would usually protect for up to 3 weeks. After that, 100 wet hours were allowed to elapse before a Topsin M application was applied. From then on, the table was used to tell when to apply the next spray. This approach has worked well.

While these programs have generally been effective, they are not based on a clear understanding of the pathogens and their biology, but on tests of varying spray intervals and the appearance of SBFS symptoms in response. The growth of the SBFS fungi is frustratingly mysterious. It isn't at all clear exactly when the flyspeck and sooty blotch fungi land on apple fruit, or how long they grow before symptoms can be seen. Some tests indicate that they can grow, then stop growing, then start again, depending on whether the fruit are wet and whether a fungicide is present.

The Kentucky work is particularly interesting, because putting a bag around fruit at 175 hours of wetting stops SBFS. If all the bag is doing is keeping inoculum from getting to fruit, then this suggests that SBFS doesn't move into orchards until 175 wet hours measured from 10 days after petal fall. But how long after that does it take for the fungus to grow and produce symptoms? Ten wet hours? One hundred wet hours? We aren't all that sure. And while the fruit bags stop infections, a captan spray at the same time doesn't. But a Topsin M spray does.

Rosenberger's work in New York consistently points toward a period of 270 wet hours, a grace period, during which the fungus is probably on the fruit, but is not developing. Apparently, if an appropriate fungicide is applied before the end of this period, and coverage is maintained, the fungus is either killed or can't grow. In at least one test, however, it is clear that the fungus is not always killed, and a break in coverage will allow it to develop into symptoms. But because we can't watch the fungus develop, we really don't know what's happening during this time.

A few studies have indicated that benzimidazoles (Topsin M) do kill that is, eradicate SBFS fungi, while captan will not. For example, Rosenberger treated apples in the field with a benzimidazole plus Captan on several dates during summer. He harvested fruit from these trees several days after treatments were applied and incubated them, along with fruit from unsprayed control trees, in moist conditions to encourage SBFS development. Sixty-six percent of unsprayed fruit harvested on 23 July developed symptoms within two weeks, compared with only 20% of treated fruit that received the first spray on 19 July. Following a second benzimidazole-captan spray on 2 Aug, only 5% of fruit harvested on 6 Aug developed flyspeck after incubation. The presence of flyspeck on the control fruit indicated that the SBFS fungi were present on the fruit by 19 July and that the benzimidazole captan fungicide sprays had eradicated them.

It is not clear exactly what the strobilurines Flint and Sovran, or the strobie/boscalid combination Pristine do in terms of eradication vs. protection, though they have generally been very effective against SBFS.

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North Carolina research did show that with the standard protectant funigicides, dilute applications are more effective than concentrate applications against SBFS. For example, with Captan 50W, 1X (dilute) applications, 53% of fruit had SB and 70% had FS. That compared with 5X applications where 97% of fruit had SB, and 90% had FS. This may be a simple coverage issue, but again, we don't know.

Add to all of this the discoveries out of North Carolina and Iowa that there aren't just two fungi causing SBFS, but many different species, and that several may occur on the same apple. It's unlikely that all of these fungi behave the same. We can only hope that forecast models can accommodate whatever growth differences there may be between the several fungal species.

So far, they appear to do that. For the time being, without a clear understanding of the biology of the SBFS pathogens, we stick with what has worked in terms of management, and what allows us to save a spray or three in June and July. And the bottom line is that this year, there has now been enough wet weather to recommend that summer sprays begin. ❖❖

GOING TOPSIN-LESS

CONTROLLING LATE SUMMER APPLE DISEASES WITHOUT TOPSIN M

(Dave Rosenberger, Plant Pathology, Highland)

❖❖ A combination of Topsin M plus Captan is commonly used during June, July, and August to control sooty blotch and flyspeck (SBFS) and summer fruit decays on apples. However, some growers may need alternative controls during August for several reasons. First, the label for Topsin M limits applications to a total of 64 oz/A/year. In the Hudson Valley, where conditions are especially conducive to summer diseases, consultants often suggest that Topsin M is most effective if applied at 12–16 oz/A in combination with Captan. At those rates, only 5 or 4 sprays are allowed per year. Under lower disease pressure, Topsin M may provide adequate control of SBFS when applied at 9–10 oz/A, rates that would allow 7 or 6 applications per season. Where high rates of Topsin M are used during summer, the annual limit for Topsin M application may be reached before the spray season is completed. Topsin M may also be unsuitable for August applications if growers are selling fruit to buyers that will not accept fruit with detectable residues of Topsin M.

Flint, Sovran, and Pristine are effective alternatives for late-season control of summer diseases (Table 2). However, these products also have labels limiting the total number of applications for each season. Growers using Sovran or Flint for scab control may not be able to use these products in late-season sprays. Pristine is a good alternative for August sprays, but it may be more expensive than the Topsin-captan combination. Captan alone, if applied at maximum label rates on a 14-day interval, will provide adequate control of SBFS and summer fruit rots. However, Captan at those rates may leave considerable visible residue, and the shorter residual activity will result in increased costs for more applications during the late season.

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In a 2006 field trial, we evaluated liquid lime-sulfur (LLS) as an option for summer disease control in organic orchards. As indicated in the table footnote, the last fungicide spray was applied 31 August, and protection from that spray was depleted by 14 September, due to accumulation of more than two inches of rainfall. From 14 September until harvest on 3 October, fruit were exposed to 181 hr of accumulated wetting, and that, combined with some spray gaps earlier during summer, brought the total flyspeck incubation period to 276 hr of accumulated wetting by 3 October. That total is slightly more than the 270 hr of wetting that usually allows appearance of the first flyspeck lesions on unprotected fruit.

Four applications of LLS at 2 qt and 4 qt, but not at 1 qt, per 100 gal controlled flyspeck just as well as four sprays of Topsin M plus Captan (the commercial standard). When LLS at 1 qt/100 gal was applied six times, or roughly every 10 days rather than every 21 days, it worked nearly as well as the higher rates of LLS. However, other trials have shown that LLS is not very effective for controlling summer fruit rots. In fact, high rates of LLS (e.g., 4 qt/100 gal) applied during summer may injure fruit skin, and that injury may exacerbate development of black rot and white rot.

We are still uncertain about the best approach for controlling summer diseases in organic orchards. Based on work completed to date, I suspect that LLS controls SBFS primarily via post-infection activity rather than via protectant activity. Thus, LLS applied at 2 qt/100 gal on a 15 to 20-day interval starting in early July might provide effective control of SBFS, so long as a final application is made close enough to harvest to prevent development of SBFS after the last spray.

Low rates of copper fungicides (e.g., 5 oz/100 gal of Cuprofix Ultra 40 Disperss) can also be used during late July and August to prevent summer fruit rots. However, even low rates of copper may discolor yellow-skinned apple cultivars. (Copper applications during June and early July will almost always cause lenticel injuries that appear as black spots on mature fruit.) We are currently evaluating the feasibility of using tank mixes of LLS and Cuprofix during August to determine if that combination will provide better control of both SBFS and summer fruit rots than either product used alone.

Phosphite fungicides may eventually provide another alternative for summer disease control. Aliette was the first fungicide in the phosphite fungicide group and it was used primarily to control Phytophthora diseases (i.e., root rots). However, the expiration of the Aliette patent allowed introduction of less expensive generic phosphites and stimulated exploration of other potential uses. In both 2005 and 2006, Dr. Turner Sutton in North Carolina conducted field tests that showed excellent control of sooty blotch and flyspeck where phosphite fungicides were combined with 6 lb/A of Captan 50W. The same rate of Captan 50W used alone was ineffective. Several phosphite fungicides were included in a 2006 trial conducted in the Hudson Valley. A phosphite-Captan combination provided residual protection during the preharvest interval (31 August to 3 October) equivalent to that of Pristine, Sovran, and the Topsin-Captan combination. Phosphite-plus-Captan combinations may prove useful for controlling SBFS during late summer after product labels are changed to include these diseases. So far as I have been able to determine, none of the phosphite fungicides currently have New York State labels that include SBFS or summer fruit rots on apples.

Final note: The very best fungicides will prove ineffective for controlling SBFS if they are not properly applied. Incomplete spray coverage and control failures can be expected when spraying in the wind, driving too fast, using low volumes of water per acre (e.g., < 80 gal/A with conventional nozzles), or attempting to penetrate dense foliage or clustered fruit. Where SBFS was a problem last year, growers should first evaluate their spray coverage to ensure that the fungicides are getting to the

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intended target. The second most common problem is failure to respray trees during late August or early September if heavy rains wash off fungicides more than 25 days prior to harvest. Given the fungicides that are currently available, complete control of SBFS and summer fruit rots is feasible if fungicides are applied at the right time and under conditions that allow good spray coverage. ❖❖

Table 2: Effects of various fungicide treatments on summer diseases in a trial conducted in 2006 at the Hudson Valley Lab in Highland, NY. [Numbers within columns followed by the same letter are not significantly different (Fisher's Protected LSD, P≤0.05).]

Material and rate of formulated product per 100 gal of spray[a]	% of Golden Delicious fruit harvested 3 Oct		
	out of grade due to SBFS[b]	flyspeck	sooty blotch
Control	99.5 f	100.0 f	100.0 e
Captan 80W 10 oz (4 appl.)	29.5 e	44.0 e	13.5 cd
Flint 50W 0.67 oz (4 appl.)	10.0 cd	19.4 cd	9.0 bcd
Sovran 50W 1.33 oz (4 appl.)	5.6 bcd	10.7 bc	5.6 abc
Pristine 38 WDG 4.8 oz (4 appl.)	1.0 ab	5.0 ab	3.0 ab
Captan 80W 10 oz + Topsin M 70 WDG 4 oz (4 appl.)	0.0 a	4.0 a	0.0 a
Liquid lime-sulfur 2 qt (4 appl.)	2.5 ab	6.5 ab	5.0 abc
Liquid lime-sulfur 1 qt (6 appl.)	0.0 a	7.5 ab	0.5 ab
Liquid lime-sulfur 1 qt (4 appl.)	14.8 d	31.5 de	22.5 d

[a] Sprays were applied 30 Jun, 19 July, 10 & 31 Aug except that treatments receiving 6 applications were also treated on 10 July and 28 July

[b] Fruit were down-graded from U.S. Extra Fancy due to sooty blotch and/or flyspeck.

PEST FOCUS

Geneva:
Apple maggot trap catch increasing.

THE WEEK THAT IS

EVENT LINEUP

Cornell Fruit Field Day

❖❖ Cornell University will host the 2007 Fruit Field Day and Equipment Show at the New York State Agricultural Experiment Station in Geneva, NY, on Wednesday, July 25, from 8:00 a.m. to 5:00 p.m. This is one of several events that commemorates the 125th anniversary of the Experiment Station, which opened its doors on March 1, 1882.

Fruit growers, consultants, and industry personnel are invited to tour field plots and laboratories and learn about the latest research and extension efforts being carried out by researchers on the Geneva, Highland and Ithaca campuses. The focus will be on all commodities key to New York's $300 million fruit industry: apples, grapes, raspberries, strawberries, peaches, pears and cherries.

During lunch, equipment dealers will showcase the latest techniques to improve sprayer deposition and reducing drift. Representatives from various companies will advise growers on the latest technologies.

The event will be held on the Experiment Station's Fruit and Vegetable Research Farm South, 1097 County Road No. 4, 1 mile west of Pre-emption Rd. in Geneva, NY. Signs will be posted. Attendees will be able to select from tours of apples, stone fruits, small fruits, and grapes, as well as a tour of the Experiment Station's labs and greenhouses. Admission is free and lunch is provided courtesy of industry sponsors. Pre-registration is requested (see form.)

For sponsorship and exhibitor information, contact Debbie Breth at 585-798-4265 or dib1@cornell.edu. More information will be posted to http://www.nysaes.cornell.edu/hort/fieldday/ in the very near future.

For additional information, contact Nancy Long at 315-787-2288 or NPL1@cornell.edu Register on line at: http://www.nysaes.cornell.edu/hort/fieldday/index.html ❖❖

INSECT TRAP CATCHES (Number/Trap/Day)

Geneva, NY

	7/16	7/18	7/23
Redbanded leafroller	0.8*	1.8	0.4
Spotted tentiform leafminer	11.9	24.0	15.5
Oriental fruit moth	0.5	0.5	0.3
Lesser appleworm	0.0	0.0	0.2
San Jose scale	158	1744	200
American plum borer	0.0	0.0	0.0
Lesser peachtree borer	0.1	0.0	0.0
Obliquebanded leafroller	0.0	0.0	0.0
Dogwood borer	–	0.0	–
Peachtree borer	0.0	0.0	0.0
Apple maggot	0.6	3.0	4.1

* first catch

Highland, NY

	7/2	7/9	7/16
Redbanded leafroller	2.0	3.9	0.3
Spotted tentiform leafminer	36.8	62.3	67.0
Oriental fruit moth	2.6	6.6	3.3
Codling moth	0.4	1.4	2.4
Lesser appleworm	0.1	0.9	1.6
Obliquebanded leafroller	0.9	0.1	0.0
Variegated leafroller	0.1	0.0	0.1
Apple maggot	0.1	0.2	0.6

UPCOMING PEST EVENTS

	43°F	50°F
Current DD accumulations (Geneva 1/1–7/23/07):	2005	1336
(Geneva 1/1–7/23/2006):	2104	1392
(Geneva "Normal"):	2015	1315
(Geneva 1/1–7/30/2007, Predicted):	2216	1499

Coming Events:	Ranges (Normal±StDev):	
Comstock mealybug 1st flight subsides	1818–2132	1216–1418
Codling moth 2nd flight begins	1555–2283	999–1529
Redbanded leafroller 2nd flight peak	1535–2041	974–1368
Spotted tentiform leafminer 2nd flight subsides	2014–2428	1332–1692
Apple maggot flight peak	2143–2579	1455–1763
American plum borer 2nd flight peak	1956–2454	1311–1701
Dogwood borer flight peak	1552–2042	976–1376
Lesser appleworm 2nd flight begins	1385–2005	903–1323
Obliquebanded leafroller 1st flight subsides	1619–2125	1037–1429
Oriental fruit moth 2nd flight peak	1378–2086	865–1415

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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