scaffolds
FRUIT JOURNAL
Update on Pest Management and Crop Development
September 2, 2008 VOLUME 17, No. 24 Geneva, NY

INSECTS

OFF SCREEN

ORCHARD RADAR DIGEST

Geneva Predictions:

Codling Moth

Codling moth development as of September 2: 2nd generation adult emergence at 98% and 2nd generation egg hatch at 85%.

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REAR VIEW MIRROR

2008 FRUIT ARTHROPOD PEST REVIEW

(Art Agnello, Entomology, Geneva)

❖❖ This has been a challenging season for growers, mainly because of the repeated hail events (which were unprecedented) and the alternating hot & cold spells (which weren't). This translated into more concerns about potential disease consequences than arthropod-related ones, but things were not altogether boring when it came to the insect situation. In general, there were no significant crises stemming from unanticipated or unattended insect or mite infestations, which is a trend we're happy to see continue for the forseeable future.

The spring started out rather cooler than "normal" (as defined by the long-term average), until we reached the 3rd week in April, when temperatures reached into the 70s and 80s for more than 10 days. By month's end, we were considerably ahead of normal DD accumulations, and many sites recorded their earliest **oriental fruit moth** biofix in recent memory (April 24 in Geneva). Macs in many orchards were at full pink bud well before May 1, and in bloom before May 5. The warm weather prompted early **plum curculio** and **European apple sawfly** activity, which were in the orchard waiting for fruits to attack days ahead of their developing. By mid-May, a cooling trend settled in, which slowed up the varietal bloom progression, so orchards could be found at anywhere from pink to petal fall around the state. Things moderated through the remainder of May during the fruit set period, bringing the heat unit accumulation back down below normal.

Early in June, a hot spell sent temperatures into the 80s and 90s for over a week, which

continued...

IN THIS ISSUE...

finished off plum curculio egg-laying activities, brought out **obliquebanded leafroller** right on schedule, and initiated some **codling moth** emergence. On June 16, the first and most damaging of the season's dozen or so hail strikes traversed the state's fruit regions, throwing everyone's plans into disarray. By the second half of the month, obliquebanded leafroller populations were notable by their scarcity, and summer **aphids** were beginning to build.

Apple maggot emerged just ahead of schedule at the end of June, and, aided by more than adequate moisture from regular rain showers, built to some impressive numbers through July and much of August around the state. Another brief hot spell the week after July 4 raised the prospects of **European red mite** outbreaks, which never really materialized. The most problematic insect of the remainder of the summer seemed to be **Japanese beetle**, which continued emerging until mid-August. **Internal leps** such as codling moth and OFM were trapped at relatively high numbers in various western NY trouble spots, but in most cases were attended to by management programs featuring some good selective insecticides and supplemented by mating disruption.

Some later summer pests that typically show up were not evident this year, including **twospotted spider mites**, which are often associated with hot and dry weather. **Woolly apple aphid** was evident in a number of places, again showing up early but not necessarily taking off the way they are capable of doing.

Other sporadic summer pests were also to be found, depending on the specific locality: **pear psylla** and **potato leafhopper**, **stink bugs**, and **San Jose scale** all generated their share of attention in one area of the state or another. As usual, we'll be looking out for the last few pests that always occur in some numbers, to get an idea of their importance as the fruit starts coming in for packing: **Comstock mealybug**, **white apple leafhopper** and **tarnished plant bug**.❖❖

GENERAL INFO

PEST EVENTS UPDATE

HOW THE NUMBERS TURNED OUT

(Dave Kain & Art Agnello, Entomology, Geneva)

❖❖ It's not all over yet of course, but our annual tally of degree day accumulations showed some interesting deviations this year, most of which ultimately resolved into another fairly normal "one for the books".

Following are comparative listings of some of the pest events that occurred this season (in Geneva) with calendar and degree-day normals. The values and dates are given +/- one standard deviation; i.e., events should occur within the stated range approximately 7 years out of 10.❖❖

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scaffolds
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EVENT	DATE Normal (+/-days)	DATE 2008	DEGREE DAYS (BASE 43 F) Normal (+/-DD)	DEGREE DAYS (BASE 43 F) 2008
APPLE MAGGOT				
1st catch	2-Jul(+/-9)	30-Jun	1424(+/-196)	1416
Peak	4-Aug(+/-11)	24-Jul	2327(+/-226)	2085
Flight subsides	2-Sep(+/-10)		3015(+/-243)	
AMERICAN PLUM BORER				
1st catch	16-May(+/-5)	19-May	438(+/-48)	518
1st flight peak	4-Jun(+/-8)	16-May	785(+/-168)	1110
1st flight subsides	28-Jun(+/-5)	19-Jun	1319(+/-94)	1163
2nd flight start	14-Jul(+/-9)	14-Jul	1749(+/-270)	1785
2nd flight peak	31-Jul(+/-8)	28-Jul	2222(+/-246)	2192
CODLING MOTH				
1st catch	19-May(+/-7)	26-May	489(+/-92)	583
1st flight peak	5-Jun(+/-12)	19-Jun	805(+/-212)	1163
1st flight subsides	8-Jul(+/-13)	30-Jun	1596(+/-275)	1416
2nd flight begins	21-Jul(+/-14)	10-Jul	1899(+/-347)	1680
GREEN FRUITWORM				
1st catch	5-Apr(+/-8)	14-Apr	94(+/-36)	113
Peak	18-Apr(+/-8)	14-Apr	158(+/-55)	113
Flight subsides	8-May(+/-10)	12-May	351(+/-108)	440
LESSER APPLEWORM				
1st catch	12-May(+/-11)	15-May	392(+/-139)	480
1st flight peak	21-May(+/-11)	19-May	543(+/-196)	518
2nd flight starts	10-Jul(+/-9)	3-Jul	1664(+/-271)	1489
2nd flight peak	17-Aug(+/-25)	21-Jul	2617(+/-524)	2003
2nd flight subsides	22-Sep(+/-25)		3141(+/-347)	
LESSER PEACHTREE BORER				
1st catch	25-May(+/-8)	15-May	589(+/-103)	480
Flight subsides	9-Sep(+/-5)		3221(+/-225)	

EVENT	DATE Normal (+/-days)	DATE 2008	DEGREE DAYS (BASE 43 F) Normal (+/-DD)	DEGREE DAYS (BASE 43 F) 2008
OBLIQUEBANDED LEAFROLLER				
1st catch	9-Jun(+/-6)	9-Jun	883(+/-56)	910
1st flight peak	15-Jun(+/-6)	9-Jun	990(+/-145)	910
2nd flight begins	8-Aug(+/-9)	4-Aug	2455(+/-200)	2384
ORIENTAL FRUIT MOTH				
1st catch	3-May(+/-8)	24-Apr	275(+/-52)	264
1st flight peak	16-May(+/-11)	8-May	443(+/-99)	407
2nd flight begins	30-Jun(+/-5)	30-Jun	1382(+/-107)	1416
2nd flight peak	12-Jul(+/-10)	10-Jul	1708(+/-240)	1680
3rd flight begins	11-Aug(+/-9)	31-Jul	2521(+/-202)	2275
3rd flight peak	29-Aug(+/-13)	27-Aug	2957(+/-300)	2967
3rd flight subsides	14-Sep(+/-22)		3170(+/-242)	
PANDEMIS LEAFROLLER				
1st catch	7-Jun(+/-6)	9-Jun	840(+/-74)	910
Flight peak	14-Jun(+/-8)	12-Jun	1014(+/-145)	1002
Flight subsides	4-Jul(+/-5)	3-Jul	1511(+/-117)	1489
PEACHTREE BORER				
1st catch	17-Jun(+/-11)	12-Jun	1057(+/-289)	1002
Flight subsides	23-Aug(+/-13)		2835(+/-310)	
REDBANDED LEAFROLLER				
1st catch	17-Apr(+/-7)	17-Apr	142(+/-34)	127
1st flight peak	4-May(+/-9)	5-May	300(+/-70)	368
1st flight subsides	1-Jun(+/-9)	26-May	720(+/-153)	583
2nd flight begins	1-Jul(+/-6)	30-Jun	1418(+/-168)	1416
2nd flight peak	14-Jul(+/-7)	21-Jul	1762(+/-222)	2003
2nd flight subsides	8-Aug(+/-11)	11-Aug	2440(+/-239)	2555
3rd flight begins	22-Aug(+/-9)	21-Aug	2809(+/-160)	2775
3rd flight peak	29-Aug(+/-11)		2981(+/-245)	

EVENT	DATE Normal (+/-days)	DATE 2008	DEGREE DAYS (BASE 43 F) Normal (+/-DD)	DEGREE DAYS (BASE 43 F) 2008
SAN JOSE SCALE - adult males				
1st flight begins	21-May(+/-8)	26-May	531(+/-88)	583
1st flight peak	30-May(+/-7)	2-Jun	667(+/-67)	700
1st flight subsides	16-Jun(+/-9)	30-Jun	1049(+/-195)	1416
2nd flight begins	15-Jul(+/-9)	14-Jul	1756(+/-173)	1785
2nd flight peak	4-Aug(+/-10)	4-Aug	2312(+/-200)	2384
2nd flight subsides	2-Sep(+/-11)		2994(+/-355)	
SPOTTED TENTIFORM LEAFMINER				
1st catch	18-Apr(+/-8)	21-Apr	154(+/-44)	209
1st flight peak	7-May(+/-7)	8-May	327(+/-63)	407
1st flight subsides	5-Jun(+/-10)	12-Jun	805(+/-139)	1002
2nd flight begins	16-Jun(+/-7)	23-Jun	1067(+/-87)	1251
2nd flight peak	8-Jul(+/-9)	14-Jul	1589(+/-207)	1785
3rd flight begins	8-Aug(+/-8)	18-Aug	2455(+/-197)	2716
3rd flight peak	22-Aug(+/-9)		2792(+/-222)	

CROP PHENOLOGY	DATE Normal (+/-days)	DATE 2008	DEGREE DAYS(BASE 43 F) Normal (+/-DD)	DEGREE DAYS(BASE 43 F) 2008
APPLE (MCINTOSH)				
Green tip	13-Apr(+/-7)	17-Apr	122(+/-26)	127
Half-inch green	21-Apr(+/-6)	21-Apr	178(+/-23)	209
Tight cluster	27-Apr(+/-6)	24-Apr	229(+/-29)	264
Pink	4-May(+/-6)	28-Apr	294(+/-19)	323
Bloom	11-May(+/-6)	8-May	385(+/-36)	407
Petal fall	18-May(+/-6)	15-May	484(+/-39)	480
Fruit set	23-May(+/-5)	19-May	557(+/-45)	518
APPLE (RED DELICIOUS)				
Half-inch green	21-Apr(+/-7)	21-Apr	195(+/-26)	209
Tight cluster	28-Apr(+/-6)	24-Apr	248(+/-28)	264
Pink	7-May(+/-7)	1-May	336(+/-40)	330
Bloom	14-May(+/-6)	12-May	433(+/-51)	440
Petal fall	23-May(+/-7)	19-May	550(+/-70)	518

CROP PHENOLOGY	DATE Normal (+/-days)	2008	DEGREE DAYS(BASE 43 F) Normal (+/-DD)	2008
PEAR (BARTLETT)				
Bud burst	20-Apr(+/-7)	21-Apr	163(+/-27)	209
Green cluster	28-Apr(+/-7)	24-Apr	235(+/-22)	264
White bud	4-May(+/-6)	28-Apr	289(+/-23)	323
Bloom	8-May(+/-7)	5-May	349(+/-37)	368
Petal fall	15-May(+/-6)	12-May	433(+/-32)	440
SWEET CHERRY				
Bud burst	20-Apr(+/-7)	21-Apr	168(+/-25)	209
White bud	29-Apr(+/-6)	23-Apr	223(+/-20)	248
Bloom	3-May(+/-7)	24-Apr	276(+/-19)	264
Petal fall	11-May(+/-5)	5-May	391(+/-30)	368
TART CHERRY (MONTMORENCY)				
Bud burst	24-Apr(+/-6)	21-Apr	196(+/-37)	209
White bud	2-May(+/-7)	24-Apr	261(+/-26)	264
Bloom	8-May(+/-6)	28-Apr	347(+/-41)	323
Petal fall	17-May(+/-6)	8-May	447(+/-44)	407

DISEASES

CORRECTION

❖❖ In the article "Postharvest Fungicides for Apples" that was published in Scaffolds last week, an error in the first sentence of the paragraph about Captan created some ambiguity concerning Captan rates. That sentence should have read, " Captan: the label rates for drenches are 25 oz/100 gal for Captan 80WDG and 1.25 qt/100 gal for Captec 4L."❖❖

ONE MORE TIME?

WHY APPLES MAY NEED A FUNGICIDE SPRAY DURING SEPTEMBER

(Dave Rosenberger, Cornell's Hudson Valley Lab, Highland, NY)

❖❖ Thirty years ago, most apple growers in New York State applied their last fungicide spray to apple trees during the first half of August. After that, they could focus on harvest issues and forget about fungicides until the apple scab season started the following spring. In recent years, many growers have found that a September fungicide spray is essential for controlling sooty blotch and flyspeck (SBFS) that would otherwise reduce pack-outs of late-maturing apple varieties. This is especially true in years when heavy rains in late August or

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early September remove fungicide residues and wet weather thereafter allows flyspeck to appear before fruit are harvested.

Our current understanding of flyspeck development was previously explained in an article in Scaffolds (Vol. 15, no. 15, 26 June 2006), and details will not be repeated here. Based on our current understanding of flyspeck, three factors come into play when deciding if late-maturing apple cultivars should be sprayed during September:

1 - All of the summer fungicides (except captan when it is used alone) will protect fruit for at least 21 days or through two inches of accumulated rainfall if the fungicides are applied at recommended rates. Fungicide residues on fruit are depleted after fruit have been exposed to two inches of rain.

2 - Flyspeck appears on apples prior to harvest only after fruit accumulate roughly 270 hours of wetting in the absence of fungicide residues. To estimate when flyspeck might appear on fruit in autumn, wetting hours that occurred during fungicide protection gaps in July and August (as determined using rule #1 to calculate fungicide depletion) must be added to wetting hours that accumulate after fungicide residues are depleted prior to harvest.

3 - The wettest harvest season in my records occurred in 2006, when heavy rains during the last few days of August removed fungicide protection and we then accumulated an additional 270 hr of wetting during the first 26 days of September. Using that season as a worst-case scenario, one can assume that any cultivars that will be harvested within 25 days from the time of fungicide depletion should not need a September fungicide spray because flyspeck will not have time to appear on fruit before harvest. The exception would be fruit that were previously exposed to extended fungicide protection gaps during summer as described in the preceding paragraph.

After combining these factors with other observations, we have concluded that flyspeck will rarely be a problem in Hudson Valley orchards that received regular fungicide sprays during summer, so long as the final fungicide spray was applied near or after mid-August, and fruit are harvested prior to 20 September. If late August and early September are unusually wet, then a September spray may be needed for fruit that will be harvested between 20 and 30 September. A September spray is often required to protect fruit harvested after 1 October. Of course, these are generalized rules that may need to be adjusted for other geographic areas and/or for inoculum density in the orchard perimeter. Furthermore, these rules apply only if fungicides are applied in such a way that residues actually last as long as predicted based on our small plot studies.

Why have September fungicide sprays become important for late-maturing apple varieties, whereas they were almost never used 30 years ago? I doubt that anyone can provide a definitive answer to this question, but some of the changes in our apple production system may have made it more difficult to control SBFS on apples.

Ag statistics show that apple production in New York increased from about 24 million (1977–79) to 28.5 million (2005–07) bushels of utilized production, despite a decrease of more than 40% in apple acreage over that same time period (1980–2006). In fact, the average yield per acre in New York State has roughly doubled over the past 30 years, largely due to the conversion of orchards to high-density planting systems.

While average production per acre was doubling, average tree height was decreasing. Given a doubling of productivity per acre combined with a 50% reduction in tree height, it might be fair to estimate that apple production per cubic foot of tree canopy has almost quadrupled over the past 30 years. In short, apples today are spaced much closer together within the tree canopy than they were 30 years ago. This dense fruit spacing makes it difficult to achieve complete coverage of the fruit surfaces when fungicides are applied during late

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summer and fall. The clustered fruit on productive limbs also dry more slowly, thereby fostering growth of the SBFS fungi.

Furthermore, because of the narrow row spacing in high-density orchards, a tractor and sprayer must be driven at least twice as far now as compared to 30 years ago if a grower wishes to spray each side of every row. Frequently, growers opt to spray only alternate rows in high-density systems, but that decision further reduces the likelihood of achieving complete fungicide coverage of fruit surfaces during late summer.

When late-season sprays do not contact all fruit surfaces, then control of SBFS on the unsprayed surfaces is dependent on redistribution of fungicide residues during subsequent wetting periods. One can assume that controlling SBFS via rain-dependent redistribution of fungicide residues will require a higher initial fungicide dose than would be necessary if the sprayer was capable of providing even fungicide coverage of all fruit surfaces. An increasing dependence on fungicide coverage via redistribution may help to explain why growers and private consultants are reporting that they must use Topsin M at rates of 1 lb/A in late summer, whereas 30 years ago rates of 6–9 oz/A provided adequate control of SBFS. In fact, rates of 6–9 oz/A of Topsin M still provide good control of SBFS in my small plot trials where trees are sprayed to drip using a high-pressure handgun. Thus, it appears that the fungicide is still as effective as it ever was, but fruit spacing in modern orchards has made it more difficult to cover 100 percent of the fruit surfaces with fungicide when sprays are applied with airblast sprayers.

Orchard fertility is another factor that may affect the incidence of SBFS in modern orchards. Russ Holze, an experienced apple grower and private consultant in the Hudson Valley, recently noted that apple growers today pay much more attention to orchard fertility than they did 30 years ago. Most farmers today expect to see healthy green foliage on their apple trees throughout the harvest season.

Researchers reported many years ago that huge quantities of carbohydrates and minerals are leached out of apple leaves during late summer rains. In fact, in one study published in 1956, researchers estimated that carbohydrates leached from apple tree canopies might total more than 700 lb/A/year (Tukey 1971). Newly formed leaves are relatively resistant to leaching, but leaves become more "leaky" as they age. So far as I know, no one has attempted to determine whether higher fertility levels and modern pest management tools have affected the quantities of carbohydrates and minerals that are leached from apple tree canopies. However, one might assume that higher fertility would result in increased levels of carbohydrate leaching.

Carbohydrates leached from leaves might affect development of SBFS if the growth of sooty blotch and flyspeck on fruit surfaces is at least partially sustained by external nutrients deposited on fruit surfaces. No one has proven that leached nutrients directly affect SBFS, but several lines of evidence support that possibility. In the fall of 2007, late-season SBFS infections appeared primarily on the upper hemisphere of Golden Delicious fruit in a research plot where fruit were well separated (and therefore were hanging vertically from the stem). The half of the fruit toward the calyx was nearly disease free (Fig. 1). This distribution of SBFS is consistent with the hypothesis that growth of the SBFS colonies was fostered by leached nutrients released from leaves above the affected fruit. (Of course, other hypotheses might also explain this distribution.) A second line of evidence comes from an apple grower who, after the Alar scare in the early 1990s, attempted to control SBFS with a "fungicide alternative" that contained various sugars. This grower reported that the sugar solution enhanced growth of SBFS and that his black apples were not very marketable despite their lack of fungicide residues.

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Fig. 1a

Fig. 1b

Figure 1: Golden Delicious fruit sometimes show a greater incidence of flyspeck on the stem-end (Fig. 1a) than on the calyx end (Fig. 1b).

To summarize, no one has yet documented (via scientific trials) that either fruit density within trees or changing fertility practices within orchards are contributing factors for the SBFS problems that have plagued many growers in recent years. However, it may be easier to accept the fact that a September fungicide spray will sometimes be needed in modern orchards if we see this change in fungicide strategy as a normal consequence of doubling our production per acre. In fact, if one considers that 30 years ago NY apple growers had to spray two acres to get the production that now comes from one acre, then adding a September fungicide spray to control SBFS on late-maturing varieties is a small price to pay for the season-long savings that accrue from spraying and maintaining only half as many acres throughout the rest of the year! ❖❖

Literature cited

Tukey, H.B. Jr. 1971. Leaching of substances from plants. Pages 67–80 in: Ecology of Leaf Surface Micro-organisms, T.F. Preece and C.H. Dickinson, eds. Academic Press, NY.

INSECT TRAP CATCHES (Geneva, NY) (Number/Trap/Day)

	8/21	8/25	9/2
Redbanded leafroller	0.3	0.5	0.8
Spotted tentiform leafminer	9.2	8.5	25.0
Oriental fruit moth	0.2	1.8*	1.2
American plum borer	0.0	0.3	0.0
Lesser peachtree borer	0.2	0.0	0.1
Lesser appleworm	0.8	0.1	0.1
San Jose scale	200	225	118
Codling moth	0.0	0.0	0.0
Obliquebanded leafroller	0.0	0.0	0.0
Peachtree borer	0.0	0.1	0.0
Apple maggot	0.2	0.0	0.1

* first catch

UPCOMING PEST EVENTS

	43°F	50°F
Current DD accumulations (Geneva 1/1–9/2/08):	3052	2076
(Geneva 1/1–9/2/2008):	3111	2143
(Geneva "Normal"):	3140	2132
(Geneva 1/1–9/8 Predicted):	3224	2206

Coming Events	Ranges (Normal ±StDev):	
Oriental fruit moth 3rd flight peak	2650–3242	1828–2252
Oriental fruit moth 3rd flight subsides	2962–3381	2000–2288
Apple maggot flight subsides	2772–3374	1908–2368
Spotted tentiform leafminer 3rd flight peak	2607–3043	1782–2118
Lesser appleworm 2nd flight subsides	2883–3467	1973–2387
Redbanded leafroller 3rd flight peak	2767–3237	1903–2325
Redbanded leafroller 3rd flight subsides	3124–3436	2142–2422
Obliquebanded leafroller 2nd flight subsides	2965–3489	2036–2458
Peachtree borer flight subsides	2525–3145	1710–2194
San Jose scale 2nd flight subsides	2639–3349	1785–2371
Codling moth 2nd flight subsides	2859–3583	1944–2536
American plum borer 2nd flight subsides	3114–3600	2165–2533
Lesser peachtree borer flight subsides	2996–3446	2017–2433
Spotted tentiform leafminer 3rd flight subsides	3230–3444	2246–2432

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