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Update on Pest Management and Crop Development

FRUIT JOURNAL

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INSECTS

VEXATION VIGIL

ORCHARD RADAR DIGEST

Geneva Predictions:

Roundheaded Appletree Borer
RAB adult emergence begins: May 26; Peak emergence: June 10.
RAB egglaying begins: June 5. Peak egglaying period roughly: June 26 to July 10.

Lesser Appleworm
1st LAW flight, first trap catch expected: May 11; Peak trap catch: May 20.

Mullein Plant Bug
Expected 50% egg hatch date: May 12, which is 9 days before rough estimate of Red Delicious petal fall date.
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 17.

Obliquebanded Leafroller
1st generation OBLR flight, first trap catch expected: June 8.

Oriental Fruit Moth
Optimum 1st generation first treatment date, if needed: May 17.
Optimum 1st generation - second treatment date, if needed: May 31.

San Jose Scale
First adult SJS caught on trap: May 15.
1st generation SJS crawlers appear: June 18.

Spotted Tentiform Leafminer
1st STLM flight, peak trap catch: May 14.
1st generation sapfeeding mines start showing: May 14.
Optimum sample date is around May 20, when a larger portion of the mines have become detectable.

White Apple Leafhopper
1st generation WALH found on apple foliage: May 13.

Highland Predictions:

Roundheaded Appletree Borer
RAB adult emergence begins: May 16; Peak emergence: June 2.
RAB egglaying begins: May 28. Peak egglaying period roughly: June 18 to July 3.

Lesser Appleworm
Peak trap catch: May 13.

continued...

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Mullein Plant Bug
Expected 50% egg hatch date: May 7, which is 6 days before rough estimate of Red Delicious petal fall date.
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 13.

Obliquebanded Leafroller
1st generation OBLR flight, first trap catch expected: May 31.

Oriental Fruit Moth
Optimum 1st generation first treatment date, if needed: May 11.
Optimum 1st generation - second treatment date, if needed: May 22.

San Jose Scale
First adult SJS caught on trap: May 9.
1st generation SJS crawlers appear: June 10.

Spotted Tentiform Leafminer
1st generation sapfeeding mines start showing: May 7. Optimum sample date is around May 12, when a larger portion of the mines have become detectable.

White Apple Leafhopper
1st generation WALH found on apple foliage: May 5.

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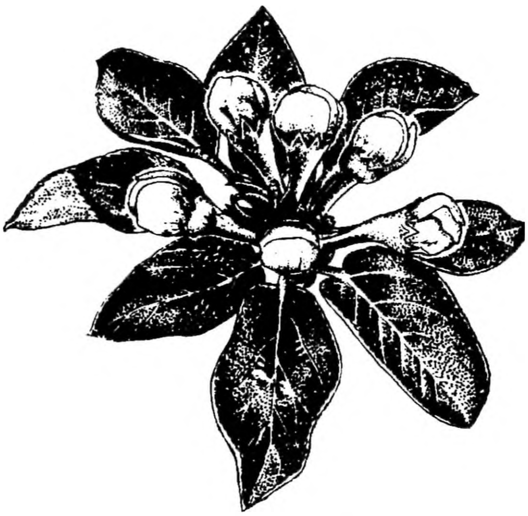

DISEASES

THE BURNING QUESTION

MANAGING BLOSSOM BLIGHT
Bill Turechek
(Plant Pathology, Geneva)

❖❖ Fire blight, caused by the bacterium *Erwinia amylovora*, is perhaps the most devastating disease of apple in the eastern US. Fire blight should be on almost every apple/pear grower's mind at this time of year when trees are in bloom. It was only 4 years ago that extensive losses occurred across much of the Midwest and Northeast when weather conditions during bloom coupled with bouts of severe weather later in the season created conditions that were extremely favorable for disease development. The following provides an overview of fire blight and discusses management options through the blossoming and post-bloom periods.

Definitions
• *Blossom blight* starts in spring when flowers become infected. The blossom blight phase

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of fire blight includes shoot death developing from bacterial invasion of the flower clusters.

- *Canker blight* starts from cankers that have survived the winter. The bacteria travel up the shoots and cause the shoot to die back. This looks very similar to shoot blight. The two can be distinguished by locating the point of infection on the shoot.
- *Shoot blight* develops from secondary infections originating on young terminal shoots. Shoot blight usually develops in late spring or early summer.
- *Trauma blight* is a term used to describe infections that occur when blight is initiated at leaf or bark injuries resulting from hail or severe windstorms.
- *Rootstock blight* occurs when bacteria from infected blossoms or shoots move internally through symptomless trunks to infect the rootstock. Trees on M.26 and M.9 are often, but not always, killed when their roots become infected.

Disease cycle

Fire blight overwinters in cankers on infected limbs. Cankers become active in early spring as temperatures warm and buds begin to develop. Active cankers produce a yellowish to white bacterial ooze that can appear several weeks prior to bloom. During this period, insects (mainly flies) disseminate the bacteria throughout the orchard. During bloom, pollinating insects rapidly move the pathogen from flower to flower, initiating the blossom blight phase of the disease. Flowers can become infected within minutes after a rain or heavy dew when the average daily temperatures are equal to 60°F or greater. Flower receptacles and young fruits are resistant after petal fall. Early symptoms of blossom blight can be expected 5 to 30 days after infection, depending upon daily temperatures.

Inoculum produced from infected blossoms is further spread by wind, rain, and insects. Shoot tip infections are likely to occur when shoots are actively growing and daily temperatures average 60°F (16°C) or more. In years when blossom infections do not occur, the primary sources of inoculum for the shoot blight phase are the overwintering cankers, particularly young water sprouts near these cankers that become infected as the bacteria move into them systemically from the canker margins. In the absence of blossom infections, the development of shoot blight infections is often localized around areas with overwintering cankers.

Rootstock blight is associated primarily with the highly susceptible rootstocks such as M.26 and M.9. On these trees, just a few blossom or shoot infections on the scion cultivar can supply bacteria that move systemically into the rootstock where a canker may develop and girdle the tree. Trees affected by rootstock blight generally show symptoms of decline and early death by mid- to late season. Sometimes symptoms may not be apparent until the following spring.

Although mature shoot and limb tissues are generally resistant to infection by *E. amylovora*, injuries caused by hail, late frosts of 28°F (-2°C) or lower, and high winds that damage the foliage breach the normal defense mechanisms in mature tissues. Instances of fire blight that originate with infections at sites of injury is called trauma blight and may affect even normally resistant cultivars like 'Delicious'.

Disease management during bloom

Managing blossom blight is achieved through well-timed chemical sprays. The level of control is critically dependent upon which product you choose to use and the timing of your sprays. The number of applications is typically far less important, *per se*, than when sprays are applied.

Streptomycin: Streptomycin applications during bloom are highly effective against the blossom blight phase of the disease. These sprays are critical because effective early season control often prevents the disease from becoming established in an orchard. Predictive models, particularly *MARYBLYT* and Cougar Blight, help to identify potential infec

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tion periods and improve the timing of streptomycin, as well as avoid unnecessary treatments, particularly during the blossom blight phase of the epidemic. Streptomycin applications are best used in a preventive mode, just prior to an infection event. You can expect at least 3 days of protection from streptomycin applied to open blossoms. In trials conducted by Keith Yoder in Virginia, approximately 50% reduction in fire blight was achieved on unopened blossoms sprayed with streptomycin that were inoculated with fire blight after they opened the following day. Higher levels of control are likely with lower inoculum levels, but excellent spray coverage is critical for protecting flowers. If you miss an infection event, it is critical that streptomycin be applied within 24 hours to reduce blossom blight. Using predictive models (e.g., *MARYBLYT*), it is possible to use local weather forecasts to predict whether an infection event is likely to occur in the next day or two. This can be extremely helpful in identifying unusually high-risk situations. In younger orchards, removing blossoms by hand will reduce the risk of blossom infection. This practice can be especially effective in minimizing losses due to rootstock blight as well, particularly when highly susceptible varieties such as 'Gala' or 'Gingergold' are grafted on to M.9 or M.26. Although somewhat time consuming, blossom removal is a much less expensive alternative than replanting an entire block.

Trauma events (hail, high winds) can put any orchard block at risk because varieties that are considered relatively resistant to blossom blight and shoot blight can suffer severe blight under trauma conditions. If a trauma event occurs when trees are actively growing, application of streptomycin within 12–24 hours after the trauma event may limit the severity of the resultant trauma blight. After midsummer when trees have hardened off for the season, streptomycin protection following trauma events may be unnecessary because trees are thought to be fairly resistant to fire blight after tree growth stops for the season. Applications of streptomycin may be not be possible after midsummer anyway because of the days-to-harvest limitations on the label.

Serenade is a biofungicide labeled for control of fire blight. Serenade is a wettable powder formulation of the bacterium *Bacillus subtilis* (strain QST713), a common soil resident. The bacterium acts by releasing cell contents during growth in order to eliminate or reduce competitors in its immediate environment. In limited testing in New York, it has shown fair activity against fire blight when used in alternation with streptomycin. Serenade should be applied as a preventive and can be applied up to and including the day of harvest. Serenade has been promoted as a tool for managing streptomycin resistance, but its effectiveness for resistance management remains unproven. If you choose to use Serenade, we (i.e., Cornell pathologists) strongly encourage that it be used in a rotational program with streptomycin and not as the sole bactericide for fire blight management. Research at Geneva suggests that *streptomycin should be the first product applied during bloom*, particularly when conditions are very favorable for the development of fire blight.

Timing streptomycin sprays according to *MARYBLYT*

MARYBLYT is a comprehensive computer program for predicting fire blight of apple and pear that was developed by Paul Steiner and Gary Lightner in 1989, and has since been used extensively by mid-Atlantic growers. The program identifies and predicts infection events and the appearance of symptoms for blossom blight, canker blight, shoot blight, and trauma blight. *MARYBLYT* is operated in real time to assess current fire blight risk or it can be run in simulation mode for predicting future events.

MARYBLYT integrates 3 cumulative heat unit "clocks" to indirectly monitor host (flowering), pathogen (epiphytic inoculum potential [or EIP]), and symptom development. The "clocks" calculate either degree days or degree hours under a given temperature base. MB uses the following four criteria to predict blossom blight:

1) Flowers open with stigmas and petals intact;
2) EIP greater than 100 (this occurs after the

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accumulation of 198 degree hours greater than 65°F within the last 80 degree days greater than 40°F for apples OR 120 degree days for pears);

3) A wetting event of 0.01 inch of dew or rain OR 0.1 inch of rain the previous day; and

4) Average daily temperature greater than 60°F.

When all 4 conditions are met in the sequence given, infection occurs. The first symptoms appear with the subsequent accumulation of 103 degree days greater than 55°F. In real time, this interval can vary between 5 to 30 or more days. The degree to which any of the thresholds exceed their minimums provides a subjective basis for estimating the severity of blossom blight infection. Cool weather has a negative effect on EIP. Specifically, a 3-day cool period (i.e., no temperature greater than 65°F) reduces EIP to 0 unless EIP had previously exceeded 200. The first cool day reduces the EIP by a third, the second by a half, and the last sets the EIP to 0. Also, the EIP is reset to zero after an antibiotic application under the assumption that this spray reduced bacterial populations to marginal levels.

MARYBLYT uses a simple +/- system to score whether or not the threshold of any of the 4 criteria have been met. Risk of infection is then rated as 'low', 'moderate', 'high', or 'infection' depending upon whether one, two, three or all four of the thresholds have been exceeded, respectively. Although infection is predicted only when all four thresholds are exceeded, infections can occur in less favorable conditions, i.e., when only 2 or 3 thresholds are exceeded. In practice, any combination of those 4 thresholds could be used as a rule to trigger a management action. Our current evaluation of *MARYBLYT* has shown that timing applications only when all 4 parameters have been "triggered" results in the fewest OVERALL mistakes. That is, a balance between 1) spraying UNECESSARILY, and 2) missing a NECESSARY spray. Because the latter mistake is potentially more costly than the former, particularly on susceptible varieties, a simple set of guidelines on how to best use MB was devised. The guidelines are 1) Moderately susceptible varieties should be sprayed only when *MARYBLYT* rates the risk "infection" (all 4 parameters exceeded); 2) Susceptible varieties should receive an application when *MARYBLYT* rates the risk "infection" — a conservative approach would also suggest an application when *MARYBLYT* rates the risk as "high" (any three parameters exceeded); 3) Young trees should be sprayed when *MARYBLYT* rates the risk as "high" or "infection" (all 4 parameters exceeded).❖❖

INSECTS

INSIDE SCOOP

HOW SOFT A CATERPILLAR STEPS

(Harvey Reissig and Dave Combs, Entomology, Geneva)

[Editors' note: To whet your appetite for impending confrontations with the 2nd generation oriental fruit moth in apples, which might be expected in early to mid-July, we thought we'd reprint the following synopsis of some small-plot insecticide efficacy trials conducted last season.]

❖❖ These treatments were tested in small plots set up in two commercial orchards in western NY that had been severely infested with internal Lepidoptera during the previous (2002) growing season. Trees in the test plots received normal applications of fungicides, but were not treated with any insecticides early in the season to allow pressure from the early generations of Lepidoptera to build up in the research plots. Treatments were applied by a hand gun sprayer on 16 and 29 July against the estimated activity of the second brood of OFM, and again on 14 and 27 August against the third brood of this pest.

The initial sprays for each generation were timed to coincide with the estimated first hatch of eggs of OFM (175-200 DD base 50°F) after pheromone trap catches indicated the beginning of the second and third flights of OFM. Treat

continued...

ments were replicated 4 times at the first location and 3 times at the second location on single-tree plots separated by unsprayed buffer trees and arranged in a RCB design. 'Ida Red' apples were treated at the first site and the second site was a mixed planting of 'Ida Red' and 'Twenty-Ounce'. Fruit damage was initially estimated by randomly picking 100 apples per treatment in each rep at both locations on 14 September, which was about 14 days after the last treatments were applied and again on 10 October, which was a normal harvest date for these cultivars. Damage was compared in these two samples to determine if any late season damage had occurred after the residual effects of the pesticides had diminished.

Damage was assessed as either "deep" (internal trail greater than 1/16") or "sting" (internal trail less than 1/16"). Internal Lepidoptera populations built up to high levels in both sites as indicated by the high levels of damage found in the untreated check plots. The organophosphate treatments (Guthion & Imidan) were statistically as effective as Calypso, Assail, Diamond, Warrior, Avaunt and Intrepid, although damage in the Avaunt and Intrepid plots was the highest among this group of compounds. Esteem and Deliver did not adequately protect fruit. Assail was the most effective treatment at both locations in protecting fruit at harvest, followed by Warrior and Diamond. The two standard organophosphates, Imidan and Guthion, were similar in effectiveness and these treatments were statistically as effective as any of the other compounds except Assail. Therefore, it appears that organophosphates can still be used to control internal Lepidoptera in most NY apple orchards, even though preliminary studies have suggested that some field populations of OFM have low levels of resistance to these materials. Damage in the later samples harvested on October 10 was higher than that observed on September 14 in all treatments, except Assail. These results show that most compounds applied during late August cannot provide adequate residual protection of fruit during September and October in apple orchards in which pressure from internal Lepidoptera is extremely high.❖❖

		Combined Sites % w/ Deep Tunnel (> 1/16")	
Material	Rate/100	(9/14/03)	(10/10/03)
Diamond	8.8 oz	9.4 ab	12.3 bc
Calypso	1.0 oz	11.6 ab	17.3 bc
Avaunt 30WG	1.75 oz	16.1 bc	22.6 cde
Esteem 35WP	1.5 oz	31.8 d	44.4 fg
Intrepid 2F	5.3 oz	15.7 bc	29.7 de
Warrior 1CS	1.0 oz	8.7 ab	10.6 ab
Assail 25WP	1.1 oz	4.0 a	3.5 a
Guthion 50W	8.0 oz	6.1 a	16.3 bcd
Imidan 70W	1.4 lbs	8.9 ab	15.7 bc
Deliver	5.5 oz	24.0 cd	35.0 ef
Untreated Control	—	49.7 e	59.4 g

Means within a column followed by the same letter are not significantly different (Fisher's Protected LSD Test, $P<0.05$). Data transformed Arcsin (Sqrt X) prior to analysis.

UPCOMING PEST EVENTS

	43°F	50°F
Current DD accumulations (Geneva 1/1–5/10):	361	183
(Geneva 1/1–5/10/2003):	340	171
(Geneva "Normal"):	380	187
(Geneva 5/17 Predicted):	537	309
Highland 1/1–5/10):	525	281

Coming Events:	**Ranges:**	
Pear psylla 1st egg hatch	111–402	55–235
Oriental fruit moth 1st flight peak	259–606	96–298
Lesser appleworm 1st catch	135–651	49–377
Plum curculio active	135–394	49–225
Green fruitworm flight subsides	170–544	69–280
Comstock mealybug 1st gen. crawlers in pear buds	220–425	82–242
Mullein plant bug 1st hatch	322–514	156–251
Mullein plant bug 50% hatch	404–589	193–289
Rose leafhopper nymphs on multiflora rose	188–402	68–208
Spotted tentiform leafminer sap-feeders present	295–628	130–325
American plum borer 1st catch	194–567	55–294
Codling moth 1st catch	273–805	141–491
San Jose scale 1st catch	189–704	69–385
European red mite summer eggs present	448–559	235–320
McIntosh at petal fall	418–563	210–298

PHENOLOGIES

Geneva:

	5/10	5/17 (Predicted)
Apple(McIntosh):	king bloom	petal fall – fruit set
Apple(Red Delicious):	pink	bloom – petal fall
Pear:	full bloom	fruit set
Sweet cherry:	fruit set	—
Tart cherry	25% petal fall	fruit set

Highland:
Apple (McIntosh/Ginger Gold):50% petal fall
Apple (Golden Delicious)): full bloom
Pear (Bartlett/Bosc): petal fall
Sweet cherry: fruit set
Peach: fruit set, shucks on
Plum: fruit set

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PEST FOCUS

Geneva:
Oriental fruit moth 1st catch 5/7.

Highland:
Plum curculio caught in trunk trap. 1st **codling moth** and **lesser appleworm** trap catches. **Obliquebanded leafroller** overwintering larvae active and feeding.

INSECT TRAP CATCHES (Number/Trap/Day)

Geneva, NY

	5/3	5/7	5/10
Green fruitworm	0.1	0.0	0.1
Redbanded leafroller	15.8	3.8	3.3
Spotted tentiform leafminer	392	44.4	86.2
Oriental fruit moth	0.0	0.1*	0.7
Lesser appleworm	0.0	0.0	0.0

Highland, NY

	5/3	5/10
Green fruitworm	0.6	0.1
Redbanded leafroller	11.6	7.7
Spotted tentiform leafminer	172	12.5
Oriental fruit moth	9.6	5.5
Codling moth	0.0	0.1*
Lesser appleworm	0.0	0.4*

* first catch

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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