



Berry Notes

Prepared by the University of Massachusetts Fruit Team

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Current Conditions:

Strawberry flower trusses are emerging from the crown. Row-covered fields will enter the bloom period soon. Once bloom begins, row-covers must be removed in order for pollination to occur. All fields should have irrigation in place for frost protection during bloom. See back issues of Berry Notes for more on frost protection. Bloom is the most important period for controlling gray mold. *More on this below.* Begin scouting for clipper and tarnished plant bug as we approach bloom. *More on these pests in the next issue.* New fields are being planted. **Raspberry** leaves are expanding. Fall raspberry new cane growth is about 6". Watch for raspberry fruitworm feeding on new leaves. **Blueberry** fruit buds are at pink bud to full bloom depending on location and variety. Some locations suffered mild to moderate frost damage 4/30 or 5/1. Sublethal damage may predispose tissue to fungal infections. In this case pay particular attention to your fungicide programs and make sure to use correct rates and get excellent coverage. [Mummyberry](#) is active at this time. See information on this in the last issue. Botrytis gray mold can also infect blossoms at this time. See more below. Be ready for pollination with adequate numbers of bee hives. The first fertilizer application should be made now and the second in about a month. Pre-emergent herbicides may still be applied, though it is getting late for this. **Grapes** buds have burst and leaves are unfolding in some varieties. Growers will need to apply protective spray soon. Scout fields for [Flea beetles](#) damage. Fertilizer may be applied now as well as pre-emergent herbicides. **Currants** and **Gooseberries** are at or past bloom and showing excellent fruit set.

2008 New England Small Fruit Pest Management Guide now available – This guide has been extensively updated and is now available for purchase for \$12 plus \$4 shipping and handling. Orders (including credit card purchases) can be placed via the UMass Fruit Team website at www.umass.edu/fruitadvisor.

ENVIRONMENTAL DATA

The following growing-degree-day (GDD) and precipitation data was collected for a one-week period, April 30, 2008 through May 6, 2008. Soil temperature and phenological indicators were observed on May 6, 2008. Accumulated GDDs represent the heating units above a 50° F baseline temperature collected via our instruments from the beginning of the current calendar year. This information is intended for use as a guide for monitoring the developmental stages of pests in your location and planning management strategies accordingly.

Region/Location	2007 GROWING DEGREE DAYS		Soil Temp (°F at 4" depth)	Precipitation (1-Week Gain)
	1-Week Gain	Total accumulation for 2008		
Cape Cod	10	92	58°F	0.50"
Southeast	11	121	67°F	0.48"
East	12	123	52°F	0.50"
Metro West (Waltham)	15	86	50°F	1.60"
Metro West (Hopkinton)	n/a	97	54°F	0.82"
Central	13	94	49°F	0.54"
Pioneer Valley	12	156	50°F	0.40"
Berkshires	6	140	53°F	0.40"
AVERAGE	10	114	54°F	0.67"

n/a = information not available

(Source: UMass Extension 2007 Landscape Message #10, May 8, 2008)

STRAWBERRY

Strawberry – Gray Mold (*Botrytis* Fruit Rot)

Jay W. Pscheidt, Oregon State University

Cause: *Botrytis cinerea*, a fungus that overwinters as sclerotia or dormant mycelia in old leaves, petioles, and mummified fruit. Conidia from within the planting are the principal inoculum and are produced readily and for a long time on diseased plant material. Conidia may infect leaves but infections generally remain symptomless until the leaf dies. Conidia readily infect the petals, stamens and pistils but not sepals. Flowers are most susceptible at anthesis. Mycelium then invades the developing fruit. Symptoms are generally delayed until fruit maturity and then progresses rapidly. ‘Northwest’ is very susceptible. ‘Benton’, ‘Hood’, ‘Linn’, ‘Olympus’, and ‘Rainier’ are moderately susceptible. ‘Shuksan’ and ‘Totem’ are least susceptible. No cultivar is immune, and even the least susceptible sustain considerable losses when environmental conditions favor disease development. The disease is more severe in high-density, double-row beds.

Symptoms: Blossom blight is characterized by petals and pedicels turning brown. The entire blossom may die. Fruit rot symptoms may occur on any portion of the fruit. They frequently develop at the calyx end and in tissues contiguous with rotting fruit or diseased flowers. Affected tissue turns light to medium brown. Lesions in green or white fruit develop slowly. The fruit may be misshapen as it enlarges. Fruit rot expands rapidly near

harvest. In advanced stages, the fungus produces a gray mold over the fruit surface. Rot may not develop until after



Note the gray, fuzzy growth over these berries.

fruit is harvested.

Cultural control:

1. Space plants so foliage dries rapidly after rain and irrigation.
2. Pick fruit as it ripens and move it quickly to cold storage.
3. Shorten picking intervals, if possible, when weather favors *Botrytis*.

4. Use optimal fertilization.
5. Time of renovation is important because fall fruit can provide considerable inoculum for the next growing season. In Oregon, it is recommended to renovate 2 to 4 weeks after the last harvest of June bearing types.
6. Remove blossoms in the planting year.
7. Under annual production in Florida it was found that removal of senescent, dead leaves reduced the amount of gray mold but did not improve overall yield. Removal of diseased fruit during harvest did not reduce gray mold or increase yield.

Chemical control: Apply during bloom period. Start at first bloom; repeat at regular intervals, especially during wet weather. Applications during fruit ripening are of questionable value. In the absence of floral applications, fruit ripening applications are worthless. In the presence of floral applications, data are incomplete on the value of fruit ripening sprays.

1. **Captan 80 WDG** at 1.9 to 3.75 lb/A. May be applied up to the day of harvest. Do not use with oil or alkaline materials. Moderately effective. Hi-Yield Captan Fungicide 50 WP may be used in the home garden at 5 teaspoons/gal water. 24-hr reentry.
2. **CaptEvote 68 WDG** at 3.5 to 5.25 lb/A Do not apply more than 2 consecutive application or more than 21 lb/A/season. Can be used day of harvest. 24-hr reentry.
3. **Elevate 50 WDG** at 1.5 lb/A. Do not use more than 2 sequential applications or more than 6 lb/A/season. Can be used up to and including the day of harvest. 4-hr reentry.
4. **JMS Stylet Oil** at 3 quarts/100 gal water is registered, but its effectiveness in the Pacific Northwest is unknown. Tank-mix with another fungicide. Do not use during freezing temperatures, above 90°F, or when plants are under heat or moisture stress. Do not use when foliage is wet as good coverage is essential. 4-hr reentry.



Soft, rotted fruit with a gray mold over the

5. **Pristine** at 18.5 to 23 oz/A. Do not use more than 2 consecutive applications or more than 5 times/year. Can be used day of harvest. 12-hr reentry.
6. **Rovral** is registered but **can not** be used past 1st flower which makes it useless for control of fruit rot. It is also registered as a preplant soak for transplants to control crown rot. Use at 2 lb/100 gal water, soak plants for 5 min and plant immediately. 24-hr reentry.
7. **Scala SC** at 18 fl oz/A alone or 9 fl oz/A in a tank mix. Do not apply more than 54 oz/A/season or within 1 day of harvest. 24-hr reentry.
8. **Switch 62.5 WG** at 11 to 14 oz/A. May be used up to and including the day of harvest. Do not apply more than twice sequentially or use more than 56 oz/A/season. Do not replant treated areas to anything other than crops listed on the label for 1 year after last application. 12-hr reentry.
9. **Thiram Granuflo** at 3.4 to 4.4 lb/A. Do not use within 3 days of harvest. Moderately effective. 24-hr reentry.

Warning: Tolerant strains of some fungi have become troublesome when Rovral is used exclusively in a spray schedule. Resistant isolates have been found throughout Pacific Northwest production areas.

To reduce the possibility of tolerance, alternate or tank-mix them with sprays of fungicides (such as captan or thiram) that have different modes of action. Do not apply more than twice a season.

Notes: Topsin M is registered for fruit rot control but is not recommended because resistant isolates of *Botrytis* are widespread, even on wild blackberries that have not been sprayed.



A basket of moldy berries.

Although **Messenger** is registered for use the commercial efficacy of this product (a bacterial protein) is unknown in the Pacific Northwest and is not recommended.

References:

Johnson, K.B., Sawyer, T.L. and Powelson, M. L. 1994. Frequency of benzimidazole- and dicarboximide- resistant strains of *Botrytis cinerea* in western Oregon small fruit and snap bean plantings. Plant Disease 78:572-577.

(Source: Oregon State University Extension [Fact Sheet Series](#))

RASPBERRY

Focus on Important Arthropod Pests of Raspberry

Greg English-Loeb, Cornell University

You can find a diversity of insects and related arthropods in a raspberry planting. Most of these are innocuous, some are beneficial and some have the potential to be pests. It behooves the grower to know something about these potential pests so they can correctly determine if they are present in their planting and what they can do about it. Obviously growers have a lot to keep track of and arthropods are just one of them, but there are some general things to know or do to help simplify the process. First, you need to regularly monitor the planting for pests or pest damage. And when monitoring, you should know what to look for and when to expect it. In this article I want to review the most likely arthropod pests you might encounter in brambles, when they are most likely to show up, what their damage looks like and what can be done about it in terms of pest control.

There are a number of potential pests of raspberries to be concerned with during the growing season. Be on the alert for feeding damage from the adult raspberry fruitworm (a beetle, light brown in color, see Figure 1) on foliage and fruit buds during the prebloom period. The larvae of this beetle pest feed inside flower buds and young fruit (Figure 2). Adult

feeding damage on foliage creates a skeletonized appearance somewhat similar to the feeding damage caused by larvae of raspberry sawfly (pale green caterpillar-like body with many long hairs, Figure 3, damage shown in Figure 4). Both the fruitworm and the sawfly appear during the prebloom period. Carbaryl [Sevin] is labeled for both of these pests and the timing is similar as is Spintor [spinosad].

Tarnished plant bug (TPB) is another potential problem for raspberry growers during the period from bloom to harvest. Both the adults (Figure 5) and their nymphs (Figure 6) can cause deformed fruit (Figure 7), although the deformities are not as obvious in raspberries as in strawberries where TPB is also an important pest. We do not have a good estimate of the economic threshold for TPB in raspberries but a rough guide would be 10 to 20% of canes infested with adults or nymphs.

Carbaryl is labeled for control of TPB on raspberry. It's not the most effective material on plant bugs but pretty much all we have with plant bugs specifically on the label. Malathion can be effective against TPB, but I have yet to find a product registered in NY with plant bug on the label for caneberries. Note that weedy fields aggravate TPB problems since the adults and nymphs will feed on a wide variety of weed species.

Raspberry cane borer and related beetle species make their appearance during this period. The adults (Figure 8) emerge in the spring, mate and start laying eggs. Larvae (Figure 9) bore



Figure 1.



Figure 2.



Figure 3.



Figure 4.



Figure 5.



Figure 6.



Figure 7.

into canes during the season and for some species, the next season. They cause injury and death to canes and potentially entire crowns. The best time to kill adults is during the late prebloom period (for summer-bearing raspberries), although note that there is nothing specifically labeled for it now that methoxychlor [Marlate] is no longer available. As an alternative to insecticides, during the season remove wilted shoot tips (Figure 10) below the girdled stem (two rows of punctures around an inch apart, Figure 11) where the egg of the raspberry cane borer has been placed. Also, during the dormant season remove and destroy canes with swellings.



Figure 8.



Figure 9.



Figure 11.



Figure 12.

Potato leafhoppers (both adults- Figure 12 and immatures) also begin appearing in New York farms after bloom. This species overwinters as adults in the southeastern



Figure 13.



Figure 14.

USA and then migrates north in spring and early summer (it does not overwinter). They feed on a lot of different crops including many small fruits like strawberries, raspberries, and grapes. They use their soda-straw like mouthparts



Figure 14.



Figure 15.

to pierce the water conducting vessels of the plant (xylem) and suck out water and nutrients. If this were all they did, it probably would not cause much problem. But they also inject saliva into the plant and for some species this causes a strong reaction in the plant. Typical symptoms include yellowing of leaf margins and distorted and possibly stunted leaves (Figure 13). Different plant species respond differently and some are very sensitive while others are not. Raspberries, grapes, and strawberries are pretty sensitive. The adult potato leafhopper is iridescent green and wedge-shaped while the nymph is usually green and moves sideways in a unique manner when disturbed. If injury to foliage is moderate to severe, control may be necessary. Sevin

[carbaryl] and Malathion 57 EC are labeled for potato leafhopper on raspberries but note there is a 7 days to harvest restriction for Sevin but only a 1 day restriction for Malathion.

I should also mention two-spotted spider mite (TSSM, Figure 14) as a potential pest. These tiny spider-like arthropods can become very numerous on foliage, causing white stippling on leaves (Figure 15). They seem to be most problematic in dry sites and/or in mild growing areas

such as the Hudson Valley and Long Island, although I can usually find a few in most plantings during the summer

period. Note that we don't have a good assessment of the economic threshold for TSSM on raspberries but a rough guide would be about 50% of leaves with at least one mite present. As of a couple of years ago there is a miticide registered in New York for control of TSSM (Savey DF).

Predatory mites can also provide control of TSSM. These beneficial mites are frequently naturally present in raspberry fields, especially where few broad-



Figure 16.

spectrum insecticides are used, but can also be purchased from a supply house. For both Savey and predatory mites, it's important to start control actions early before you see lots of severe injury to foliage (bronzing).

Another pest that can cause serious injury to canes and the crown is the Raspberry crown borer. The larvae of this moth (Figure 16) feed at the base of the cane and into the crown over a two-year period. The first signs of a problem often appear during fruit maturation. The



Figure 18.



Figure 19.



Figure 20.

withering of and dying of canes, often with half matured fruit, can be a symptom of feeding damage at the base. Canes with these symptoms, and the associated crowns, should be removed during the growing season and destroyed. The adult moth actually does not appear until later in the summer (early August). It is a very attractive moth that superficially resembles a yellow jacket (Figure 17). Guthion was labeled for use against raspberry crown borer larvae through the 2006 season but will no longer be allowed after this September. For the 2006 season the

pyrethroid insecticide bifenthrin (Capture) has been approved for use against crown borer. Apply to lower parts of canes and soil in fall to kill newly hatched larvae or possibly in the spring to kill overwintered larvae that are attempting to bore into canes. Research conducted at the



Figure 17.

University of Arkansas suggests the fall application is the more effective timing.

Although this is not an exhaustive list, the pests included in this article are the most likely to cause you problems. Some other species that might show up include sap beetles feeding on ripe and over ripe fruit (picnic beetles, fig 18,

have black and white spots, strawberry sap beetle, Fig. 19, is smaller and brown in color) and adult Japanese beetles (Fig. 20) feeding on foliage. For additional information consult the 2006 Cornell Pest Management Guidelines, Raspberry Production Guide, or the Compendium of Raspberry and Blackberry Diseases and Insects.

There are several useful web sites to consult for pest management information. Marvin Pritts of Cornell University put together a valuable diagnostic tool for the web to help you identify pest problems in small fruit crops. The web site address is

<http://www.hort.cornell.edu/department/faculty/pritts/BerryDoc/Berrydoc.htm>. Also, a new website for bramble pest management has been recently launched by NABGA (North American Bramble Association). Doug Pfeiffer, Professor of Entomology at Virginia Tech, put this useful resource together. The web site is <http://www.ento.vt.edu/Fruitfiles/NABGAIPMSite/NABGAIPMHome.html>.

References:

Pritts, M. et al. 2006. Cornell pest management guidelines for small berry crops. Cornell Cooperative Extension.

Pritts, M. and D. Handley (eds). 1998. Raspberry production guide. Northeast Regional Agricultural Engineering Service.
 Ellis, M., R. Williams, and B. Williamson. 1991. Compendium of raspberry and blackberry diseases and insects. APS Press.

Reprinted with permission from the North American Bramble Growers Association 2006 Conference Proceedings, p42-43.

(Source: New York Berry News, Vol. 5, No. 4, April 24, 2006)

BLUEBERRY

Using Bees for Pollination of Blueberry

Zachary Huang and Rufus Isaacs, Michigan State University

Pollination is an essential component of profitable blueberry production. Well-pollinated fields of highbush blueberry have larger berries, higher yields, and more even ripening than fields with low pollination. Pollination is achieved by bees moving pollen from one flower to another, and so growers should ensure that fields are stocked with healthy hives throughout the bloom period. Even though highbush blueberry cultivars have relatively high levels of self-fruitfulness (can set fruit from pollen of the same cultivar), cross pollination (from another cultivar) can increase yields by up to 20%.

Wait until bloom has started to bring in bees - In general, flowers of blueberries are less attractive to honeybees than other flowers due to the shape and the relatively low 'reward', so you want to have your crop starting to bloom before bringing bees in, so that bees tend to forage more on your crop. If brought in too early, bees will learn to forage elsewhere and when your crops bloom, they are not attractive enough to get the bees "back" to where you want them. Move bees into blueberry fields after 5% bloom but before 25% percent of full bloom.

Rental prices - Most growers will already have their pollination contracts set, but expect to pay anywhere from \$40-70 per colony for spring fruit pollination. Rental prices are generally going up because of the colony collapse disorder, but this is still an essential investment. There is a range of costs because if you only need 10 hives, you might be expected to pay a higher price than the other grower who is renting 500 hives. Colonies might be also of different strengths. Try to deal with the same beekeeper year after year in your area so you know what to expect and can build a good working relationship. If the beekeeper is new in the pollination business, make sure he/she knows your requirements and consider signing an agreement for pollination purposes. This can include the strength of the colonies and how quickly the colonies will be taken out of the field after bloom.

Stocking densities - The invasion of Varroa mite has decimated the numbers of feral (unmanaged, wild) honeybee colonies that used to contribute to pollination in addition to rented colonies. The proportion of pollination caused by feral bees relative to managed

colonies is unclear, but it is safe to say that we need higher densities today than when feral bees were present. Research in blueberries has shown variation in their needs for bee pollination, and this is reflected in Table 1. A good rule of thumb is that you'll need 4 to 8 bees per bush in the warmest part of the day during bloom to achieve good pollination. Do not cut corners with respect of putting enough bees in your crops. Investing some money to have enough colonies there at the right time will provide returns in the form of improved yields.

Table 1. Recommended stocking density of honeybees for highbush blueberry pollination.

Variety	Honeybee hives/acre
Rubel, Rancocas	0.5
Weymouth, Bluetta, Blueray	1.0
Bluecrop	1.5
Elliot, Coville, Berkeley, Stanley	2.0
Jersey, Earliblue	2.5

Hive placement - If possible, place the colonies in a sheltered location with the entrances facing east. This will encourage earlier activity as the hive warms in the morning sun. Hives should be spread out around the field to maximize floral visitation, with a maximum of 300 yards between colonies.

Bumblebees - The native *Bombus impatiens* bumblebees are highly efficient bees for pollinating blueberry, with activity at lower temperatures than honeybees and higher rates of pollen transfer per visit to flowers. These are available commercially and can be shipped directly to the farm. MSU will be conducting evaluations of these bees at commercial blueberry farms this spring to determine their effectiveness. This alternative to the honeybee has performed very well in trials in lowbush blueberry in Maine and in rabbiteye blueberries in the southeast.

Native Pollinators - Many other helpful native bees are active in your blueberry field, and with 20,000 recorded species of bees worldwide, some local native bees are probably active in Michigan's small fruit crops providing free pollination. Bumblebees and other native species can be seen looking for flowers already in and around fruit crops, and their activity generally remains high when weather

conditions turn too cold or wet for honey bees. These native bees may be insufficient to provide adequate pollination for good yields, however, and cannot be relied on to stand alone as your sole pollination source. By providing the right nesting habitats, and food for the bees after your crop has flowered, you can enhance the local populations of native bees around your crop. This is a long-term process and you'll need several years of experimenting before these bees can become a reliable part of your pollination planning. Ongoing research at MSU is investigating strategies for conservation of native pollinators in Michigan blueberries.

Pest Management During Pollination - Do not apply broad-spectrum insecticides when flower buds are open or you may kill a significant number of pollinators. Bee hives should be removed immediately after pollination if post-bloom pesticide applications are planned. By monitoring for pest problems carefully during bloom, growers can help minimize the need for pest control. If

an insecticide application is necessary during bloom, the compounds that are least toxic to bees should be used, with careful observation of the pollinator-restrictions on the label. Two insecticides that can both be applied during bloom for control of moth larvae in blueberry and cranberry are the *Bacillus thuringiensis* (Bt) products, and the insect growth regulator tebufenozide (Confirm). Good coverage is required for both, and a spreader/sticker should be used to improve effectiveness. Inform the beekeeper 2-3 days before application so that precautions can be taken to minimize bee exposure. Late evening application is better than morning application and in general liquid form is less harmful to bees compared to the power form. More information and a list of chemicals with their toxicity to bees is available from a recently-updated extension bulletin from Oregon State University at <http://extension.oregonstate.edu/catalog/pdf/pnw/pnw591.pdf> (*Source: Michigan Blueberry IPM Update, Volume 1, No.3, May 1, 2007*)

Gibberellin to Enhance Blueberry Fruitset

Eric Hanson, Michigan State University

Compared to most fruit crops, a high percentage of blueberry flowers normally produce fruit. When bees are numerous and weather is warm and calm, 80-95 % of flowers may set fruit. However, cold, rainy weather during bloom restricts honey bee activity and pollination, resulting in lower fruit set and often reduced berry size. Flowers that are not pollinated within 3-5 days after opening are unlikely to set fruit. After normal pollination, berry growth is dependent on the production of gibberellin and perhaps other growth promoters in the ovary tissues and viable seeds. If flowers are not pollinated, they abort. If only a few ovules are fertilized, the fruit may set, but not contain enough seeds to grow to full size.

When pollination is limited by poor weather, gibberellin (GA) sometimes improves % set and berry size. Several GA products (ProGibb, GibGro) are labeled for highbush blueberries. GA may result in retention of some seedless (parthenocarpic) fruit that normally drop, and increases the size of berries with low seed numbers. GA can be applied in a single spray during bloom (80 gram active ingredient per acre) or two 40 g sprays, one during bloom and the second 10-14 days later. Higher spray volumes (40 to 100 gallons per acre) may improve coverage and effects. Slow-drying conditions also increase absorption. Also make sure your spray water pH is not above 7.5.

Since the cost of 80 g of GA is over \$100, it is important to know when to use GA. If weather has been reasonable good for bee activity and the white corollas fall easily from the bushes, pollination is probably adequate. Keep in mind that blueberries can bloom over a long time, and often only a few days on good conditions is enough to provide adequate pollination. Consistently cold, rainy and/or windy weather through bloom causes pollination problems. If the corollas stay on the bushes longer than usual and turn red/purple before eventually dropping, pollination may have been inadequate. The corollas of pollinated flowers drop readily while still white. Varieties with fruit set problems (Jersey, Coville, Earliblue, Berkeley, Blueray) are most likely to benefit from GA. Jersey, for example, is relatively unattractive to honeybees, and berry numbers and size are often limited by inadequate pollination. GA does not always provide a benefit, and effects can be subtle. A key to learning about GA benefits is to leave non-treated check rows. This is the only way to tell if your money was well spent.

2006 Trial. Because weather during bloom was poor, we treated Jersey bushes at the Southwest Michigan Research and Extension Center with ProGibb applied twice at 40 g a.i./acre (17, 27 May) or applied once (17 May) to a single application of 80 g/acre on. On 17 May, 30% of Jersey petals had fallen. Treatments were applied in 50 gallons spray per acre.

Results were fairly typical for years when there is a response to ProGibb. The 80 g rate applied once increased yield by about 30% over control plots, and there was a trend towards a response from the 40 g treatment as well (Table 1). The higher yield appeared to result from more berries rather than an increase in average berry weight. During the week prior

to the first ProGibb spray, measurable rain occurred every day, and maximum daily temperature exceeded 60oF only on one day. These are the type of conditions when growers are likely to see benefits from ProGibb.

Table 3. Effect of ProGibb applications of average berry weight and yield of ‘Jersey’ blueberries, SWMREC, 2006.

Treatment	Average berry weight (g)		Yield (lb/bush)		
	1st pick	2nd pick	1st pick	2nd pick	Total
Control	1.22 a	0.78 a	4.1 a	0.9 a	5.0 a
ProGibb 40 g twice	1.18 a	0.82 a	5.0 a	1.1 a	6.1 ab
ProGibb 80 g once	1.27 a	0.85 a	5.0 a	1.5 b	6.5 b

(Source: Michigan Fruit Crop Advisory Team Alert, Vol. 22, No. 4, May 1, 2007)

Botrytis Blight and Fruit Rot *Botrytis cinerea*

Annemiek Schilder, Michigan State University, Bill Cline, North Carolina State University

Botrytis blight and fruit rot is a minor disease in most years but sometimes causes serious damage. Economic losses are mostly due to blossom blight and fruit rot.

Symptoms On leaves, brown, irregular lesions develop that sometimes distort leaves. Blighted blossoms turn brown and soon become covered with abundant gray mold. Infected twigs are first brown to black and later become tan to gray.

Developing berries can also become infected, but fruit rot usually does not develop until after harvest. Infected berries become covered with a fluffy gray mold. Disease cycle

The fungus overwinters as mycelium or hard black mycelial masses (sclerotia) on infected plant material. In spring, numerous airborne spores develop on plant debris and sclerotia. The fungus infects tender green twigs, blossoms, leaves, and fruit. Older plant parts are rarely attacked. Moderate temperatures (59 to 68½F) and frequent rains favor disease development.

Management Remove infected plant material; reduce humidity in the canopy; apply effective fungicides during bloom and fruit ripening; avoid excessive use of nitrogen fertilizer in the spring; cool berries rapidly after harvest. (Source: Michigan Blueberry IPM Update, Volume I, No.3, May 1, 2007)



Leaf lesion (left) and twig blight (right) caused by Botrytis.



Flower blight (left) and postharvest rot (below) caused by Botrytis.

GRAPE

Stunted Shoots

Alice Wise, Cornell Cooperative Extension of Suffolk County

You’re riding along on the tractor in May and notice a vine with stunted shoots. What could it be?

- **Cold spring weather** – After budbreak, cool, cloudy weather can slow growth, making shoots look pale and anemic. This is because early shoot growth relies on vine reserves; cool, cloudy weather slows mobilization of reserves. Shoots will ‘green

up’ with warm weather. Some growers feel an early application of foliar nitrogen helps overcome this stage.

- **Damage to bud** – an occasional shoot looks pale and stunted w/ whitish, mottled leaves. ‘They’ say this reflects low temp injury to the bud.

- **Canes**, particularly long canes, may have an exacerbated case of stunted shoots in the mid-cane area due to the effects of apical dominance.
- **2,4-D injury** – Drift from this herbicide causes very distinct symptoms. In moderate to severe cases, shoots are stunted, leaves are small, pale and distorted. Veins are pronounced and the leaf edge jagged.
- **Glyphosate** – If green tissue is contacted during a fall application of glyphosate, symptoms can be manifested the following spring. Spindly shoots and small, pale, distorted, sometimes arrow-shaped leaves are characteristic. While it sounds similar to other causes of stunted shoots, the experienced eye can distinguish between them.
- **Eutypa dieback** – Appears as stunted shoots with pale yellow cupped leaves. Often shoots grow out of the symptoms but they recur the following spring. One trunk can be affected and not the other. In cross section, the trunk will have a pie shaped canker. However other lesser known trunk rots can also cause this symptom. Eutypa can be found here but there are a plethora of trunk diseases. The diagnostic symptoms for Eutypa are the stunted shoots with pale, cupped leaves.
- **Thrips** – Tiny leaves, stunted shoots, leaves often somewhat tattered or shredded in appearance with necrotic (dead) areas may be due to a thrips infestation. An affected shoot can be next to a shoot with no symptoms. Thrips are impossible to see without a good hand lens or microscope. Older leaves are usually not affected. It is less common to see thrips now; usually bloom and the weeks after are the prime time. Thrips infestations are not common but do occur occasionally. In my limited experience, thrips infestations tend to affect a larger area in the vineyard vs. a mite infestation, which tends to be more spotty.
- **European red mite** – Very stunted, pale shoots that usually located close to the trunk or cordon vs. way out on the end of a cane. Upon close examination, leaves are loaded with tiny red mobile mites. Be sure to check both the upper and lower leaf surfaces. Early spring outbreaks are usually spotty.
- **Virus** – Fortunately rare on LI, fan leaf virus leads to very stunted shoots with highly serrated leaves. Vines should be pulled out, along with as many roots as possible. There were a couple of infected blocks a few years ago and nothing since. There are many other viruses that affect grapevines.

Bottom line: flag suspicious vines, follow them through the season. We can send photos/ descriptions to Cornell virologist Dr. Marc Fuchs. Also, he will be visiting Long Island later in the season so it is worthwhile to flag vines for his direct observation.

- **Boron deficiency** – Though not common, apparently boron deficiency can be manifested as slightly distorted leaves on young shoots. If in doubt, send a sample to a lab for analysis and emphasize that you need the results ASAP. If this is the case, a light foliar app of boron is the remedy. Note – it is worth doing the tissue analysis as B deficiency and toxicity symptoms can be confused.
- **Boron toxicity** – The window from B toxicity to deficiency is narrow. Sometimes occurs if a heavy soil application (or tractor slows down at end of row) was done the previous fall. Has occurred where ground application was followed by rapid uptake or where movement through the soil was limited by compaction. Toxicity symptoms are distinct. Leaves are slightly puckered and rounded, losing the serration on the edges. Often necrotic flecks can be seen on leaves. Where injury is more pronounced, shoots are spindly, leaves are tiny, chlorotic and cupped, reminiscent of Eutypa. Shoots can display both symptoms. Sometimes one side of a vine is more profoundly affected than the other. Where boron toxicity has been suspected, petiole and leaf analysis (our results for each were similar) has confirmed the diagnosis. Typically boron levels are 30-50 ppm with the lower end of that range more common on LI. Samples from damaged vines were in the 60-65 ppm range, even higher where symptoms were pronounced. Most vines will outgrow symptoms with TLC. Avoid moisture stress, thin or remove crop on affected vines.
- **Potassium deficiency** – Again, this is something that has tended to show up in summer more than in early spring but it merits a mention. We have seen several cases in years past where severe potassium (K) deficiency led to stunted shoots with tiny, malformed leaves. Dry conditions (potassium moves with the soil water) aggravated conditions. This has tended to occur in younger plantings. Perhaps cover crops used preplant utilized a lot of K and it was not replaced via fertilization. Petiole analyses are a quick way to verify the condition. (*Source: Long Island Fruit & Vegetable Update, No. 8, MAY 4, 2007*)

General

Getting the Most out of Early Season Weed Sprays

Bruce Bordelon, Purdue University

Fruit growers often apply a post-emergent herbicide beneath the tree or vine row in spring to control winter annuals and other weeds. A pre-emergent herbicide may be included in this application. Glyphosate (Roundup) is a post emergent systemic herbicide that is widely used for this first weed spray. In order for glyphosate to be effective, it needs to be absorbed into the plant. In soft water glyphosate has no problems in being absorbed. However in hard water glyphosate will be 'tied up' and not absorbed as readily. Hard water, common in many parts of Indiana, contains high concentrations of soluble salts, calcium and magnesium. When these cations are present they react with the negatively charged glyphosate to form compounds that are not readily absorbed by plants. This results in poor uptake and poor weed control.

The solution to the hard water problem is to add ammonium sulfate to the spray water before mixing

with glyphosate. Ammonium sulfate ions tie up the calcium and magnesium ions forming conjugate salts. Additionally, some of the glyphosate reacts with ammonium to form a compound that some weeds preferentially absorb. Follow the Roundup label recommendations on the amount of ammonium sulfate to add.

Another problem associated with spray water quality is that many fungicides and insecticides break down quickly in high pH water. Captan, Imidan, malathion, and Omite are examples of compounds that are especially vulnerable to alkaline hydrolysis. Both the Midwest Commercial Tree Fruit and Small Fruit and Grape Spray Guides have a discussion of spray tank pH. Briefly, addition of about 2 ounces of food grade citric acid per 100 gallons of water will lower the pH from about 8.0 to about 5.5. (*Source: Facts for Fancy Fruit, Volume 8, Issue 3, April 2008*)

Upcoming Meetings:

May 20, 2008, **UMass Fruit Team Twilight Meeting**, UMass Cold Spring Orchard (www.coldspringorchard.com/)

5:30 PM Farm tour including update on phenology and current pest status.

6:30 PM Speaking program will include updates of current cultural and integrated pest management practices. This meeting will feature current work on wine and table grapes and high tunnel blackberries as well as an update on apple thinning and other tree fruit topics.

Pesticide-license recertification credit (2 hours) will be offered at all meetings. You must be there on time to receive pesticide credits. \$20/person registration fee. (Except NH meeting.) Light refreshments will be served.

May 21, 2008, **UMass/UNH Fruit Team Twilight Meeting**, Kimball Fruit Farm, Pepperell MA (www.kimballfruitfarm.com/)

5:30 PM Farm tour including update on phenology and current pest status.

6:30 PM Speaking program will include updates of current cultural and integrated pest management practices. *Pesticide-license recertification credit (2 hours) will be offered at all meetings. You must be there on time to receive pesticide credits.*

May 21, 2008 **Early Season Berry Workshop** Swistack Farm, 6644 Greenway New London Rd, Verona, NY, 12:00 noon. contact Cindy at 315-736-3394 ext 124 or go to

<http://www.hort.cornell.edu/extension/commercial/fruit/Berries/calendarpdf/Oneida%20Early%20Season%20Berry%20Workshop.pdf>

May 22, 2008, **UMass Fruit Team Twilight Meeting**, TBA, check www.umass.edu/fruitadvisor for update

5:30 PM Farm tour including update on phenology and current pest status.

6:30 PM Speaking program will include updates of current cultural and integrated pest management practices. *Pesticide-license recertification credit (2 hours) will be offered at all meetings. You must be there on time to receive pesticide credits. \$20/person registration fee. (Except NH meeting.) Light refreshments will be served.*

For more info on the Fruit Team Meetings, go to <http://www.umass.edu/fruitadvisor/meetinginfo/april08twilight.pdf> .

May 22, 2008 **Strawberry Cultivation Equipment Demonstration**, Green Acres Fruit Farm, 960 Manitou Rd., Rochester, NY 14612, 3:00 – 4:30 PM. For more information go to

<http://www.hort.cornell.edu/extension/commercial/fruit/Berries/calendarpdf/STRAWBERRY%20CULTIVATION%20EQUIPMENT%20DEMONSTRATION.pdf>

June 3, 2008, **On Farm Biodiesel Workshop** - State Line Farm, Shaftsbury VT

9:00-Noon: Hands-On Instruction: Make Your Own Biodiesel

1:00-4:00 pm: Tour the On-Farm Biodiesel Facility and a Mobile Processor

Pre-Registration is Required Registration for the morning session costs \$15 and is *limited to 36 people*. Mail your contact info with a check to 'UVM Extension' 11 University Way, Brattleboro VT 05301, so it arrives no later than May 30. The afternoon session is free but please register by calling Vern Grubinger at 802-257-7967 x13 or email: vernon.grubinger@uvm.edu.

June 9, 2008 **Berry Grower's Field Meeting** 4 locations in Schoharie/Albany County Area

10:00 am – Bohringers Fruit Farm, 3992 State Rt. 30, Middleburgh, NY 12122. Broad array of berries to look at here, the focus will be on strawberry and raspberry pest management. Weed control options at renovation and in the fall will be discussed.

12:00 pm – Scotch Ridge Berry Farm, 5092 Scotch Ridge Road, Duanesburg, NY 12056. We will be focusing on blueberry pest management at this stop. Learn about how to use insect traps as a way to predict problems with fruit fly and blueberry maggot. A brief discussion of Ribes pest management as well.

3:00 pm - Feura Farm, 210 Onesquethaw Creek Rd., Feura Bush, NY 12067. We will touch on strawberry and raspberry weed and pest management. We will learn how to scout both these berries for pest problems.

5:00 pm - Indian Ladder Farm, 342 Altamont Rd., Altamont, NY 12009. Learn more about pests and diseases of blueberries and brambles. We will also be taking a look at the raspberries grown in a high tunnel. Indian Ladder has strawberries both in and out of a hoop house – some of which are being grown in raised planting trays where nutritional issues are of interest.

There is no cost for this program, but please pre-register by calling 518-885-8995, and let us know where you'll be meeting us. NYS DEC Pesticide Applicator recertification credits will be available. For more info go to: <http://www.hort.cornell.edu/extension/commercial/fruit/Berries/calendarpdf/6908%20Field%20Meeting.pdf>

June 11, 2008. **New Hampshire Tree Fruit and Berry Twilight Meeting** at Butternut Farm, Meaderboro Rd, Farmington, NH.

5:30 - 8:00 pm. Hosts: Giff and Mae Burnap. For more information, contact George Hamilton at george.hamilton@unh.edu or 603-641-6060.

July 9, 2008. **New Hampshire Tree Fruit Twilight Meeting**, 5:30 - 8:00 pm. This meeting was scheduled in response to a request made by Tracy Leskey. Dr. Leskey will have research projects going on at both Poverty Lane Orchard (West Lebanon), and Apple Hill Farm (Concord). We will be finalizing which site for the meeting later. Speakers: Dr. Tracy Leskey, Research Entomologist at the USDA-ARS Appalachian Fruit Research Station in Kearneysville, WV and Dr. Starker Wright, Support Scientist at the USDA-ARS Appalachian Fruit Research Station in Kearneysville, WV. For more information, contact George Hamilton at george.hamilton@unh.edu or 603-641-6060.

June 12, 2008 **Getting Ready for Raspberries: Raspberry Killed Sod Demonstration**, Dan's Berry Farm, 5027 Dubois Rd., Ithaca, NY 14850 More info at:

www.hort.cornell.edu/extension/commercial/fruit/Berries/calendarpdf/Raspberry%20killed%20sod%20demonstration.pdf

Aug. 20-21, 2008 **NASGA Summer Tour** Columbus, Ohio. See <http://www.nasga.org/> for more information

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