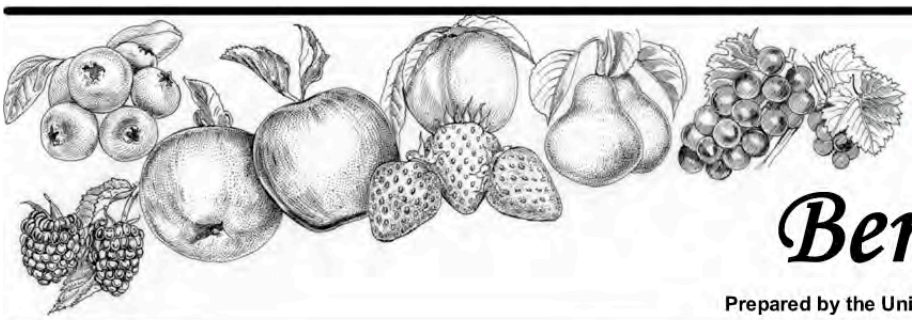

Berry Notes

Prepared by the University of Massachusetts Fruit Team

June 2007 Vol. 19, No. 9

http://www.umass.edu/fruitadvisor/berrynotes/index.html

Massachusetts Berry Notes Underwriters:

NOURSE
Growers of the Finest Small Fruit Plants

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IN THIS ISSUE:

Current Conditions:

Strawberries: Harvest is well underway. Two-spotted spider mite populations may spike in coming weeks (see article below). Severe infestations may require pre-renovation miticide applications. Watch for potato leaf hopper infestations in new plantings. Remember to keep up with blossom removal on new plantings. **Blueberries** are approaching berry touch. Cranberry Fruitworm moths are active now. Check for infestations by looking for individual fruit that turn prematurely blue accompanied by webbing and frass. Blueberry maggot yellow rectangle traps should be put in place this week. Sphere traps can be placed about 1 week after the rectangle traps. Keep an eye out for aphids. Control as soon as you find them because they can transmit blueberry scorch virus into your planting. Control options include Provado. Look for and prune out phomopsis or fusicoccum twig blight. Last chance to get N-fertilizer on now before July 4th cutoff. Late nitrogen applications can lead to greater suceptibility to winter injury. **Raspberries** are in fruitset. Some plantings are showing winter injury with tip dieback and weak foliage (small, yellowing). But other locations show vigorous canes with heavy fruitset. Botrytis fruit rot management is still a primary issue. Tarnished plant bug can still cause some damage to later fruit. Watch for twospotted spider mites and potato leafhopper, especially in fall fruiting varieties. As with blueberries, final N-fertilizer applications can be made now. **Grapes** are in varying stages of bloom. Continue disease management programs for Phomopsis, Powdery Mildew, Downy Mildew, Botrytis and Black Rot. Other diseases (anthracnose, zonate leafspot, angular leafspot) may also be found following the very wet weather so far this growing season. Insects that will need attention now are Potato Leafhopper, rose chafer/Japanese beetle and Grape Berry Moth. Cluster thinning and shoot positioning should be underway. **Currants and Gooseberries** are near harvest for early varieties. Watch for two-spotted spider mite, potato leaf hopper, currant borer and gooseberry fruitworm. Powdery mildew can develop now, too. Time harvests before severe heat, if anticipated, to avoid fruit drop.

ENVIRONMENTAL DATA

The following growing-degree-day (GDD) and precipitation data was collected for a one-week period, June 7, 2007 through June 13, 2007. Soil temperature and phenological indicators were observed on or about June 13, 2007. 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 2007		
Cape Cod	84	561	70˚F	0.50"
Southeast	87	574	62˚F	1.10"
East	92	638	65˚F	0.10"
Metro West	102	606	65˚F	0.28"
Central	94	529	55˚F	0.17"
Pioneer Valley	102	633	63˚F	0.57"
Berkshires	95	519	69˚F	0.11"
AVERAGE	94	580	64˚F	0.47"

n/a = information not available

(***Source**: UMass Extension 2007 Landscape Message #16, June 15, 2007*)

STRAWBERRY

Postharvest Handling and Storage of Strawberries

Jennifer DeEll, OMAFRA

Strawberries are one of the most perishable fruit crops and are essentially fully ripe at harvest. They have a high rate of metabolism and will destroy themselves in a relatively short time, even without the presence of decay-causing pathogens.

Maturity and Harvesting

The harvest date is determined based on berry surface color. All berries should be harvested near full ripe (>¾ red color), as eating quality does not improve after harvest. Appearance (color, size, shape, and freedom from defects), firmness, flavor (soluble solids, titratable acidity, and flavor volatiles), and nutritional value (vitamin C) are all important quality characteristics. For acceptable flavor, a minimum 7% soluble solids and/or a maximum 0.8% titratable acidity are recommended.

Strawberries have a relatively high rate of respiration (50-100 mL of C02 per kg per hour at 20°C) and thus are highly perishable. They produce very little ethylene (<0.1 ppm per kg per hour at 20°C) and do not respond to exogenous ethylene by stimulation of the ripening processes. Removal of ethylene from storage air may reduce disease development in all berries

Strawberries are usually hand harvested and field packed. Berries are harvested with the calyxes attached and must be held loosely in the hand to avoid bruising injury and discoloration. The strawberries must be handled with care and placed gently into the container, not dropped into it. Harvest should be as frequent as needed to avoid over-mature berries. Fruit should be sorted carefully, to discard any fruit with fungal lesions or injuries. Harvesting, sorting, and packing should be done simultaneously in the field. Packaging strawberries in the field has the advantage that berries are only handled once. Studies of fruit quality loss have shown that most damage occurs in the field during picking and packing. Therefore, minimizing berry handling is critical to good quality maintenance and postharvest life.

Cooling and Low Temperature

Good temperature management is the single most important factor in reducing strawberry deterioration and maximizing postharvest life. The best way to slow spoilage is to quickly remove field heat and to maintain the berries as close to 0°C as possible. Deterioration of ripe strawberries is enhanced by high fruit temperature, which hastens metabolic activities, decay development, and internal breakdown. Any failure to maintain produce at low temperatures during handling, storage, and transportation will result in loss of quality and marketability. Berries held at 20°C have only ¼ to ½ the life expectancy of those held at 0°C and market life will be reduced to only a few hours if strawberries are held near 30°C, as may occur in the field.

Berries should be protected from warming when they remain in the field after harvest. Due to their dark color, strawberries in direct sun exposure will absorb heat and quickly warm to above air temperature. The amount of warming depends on the temperature difference between the berries and air, the duration of sun exposure, the amount of air flow (breezes) over the berries, and the presence of moisture in the air and/or on the fruit surface.

Precooling (rapid removal of field heat) of strawberries is essential within 1 hour of harvest. Cooling delays of 2, 4, 6, or 8 hours reduces marketability by 20, 37, 50, or 70%, respectively, after holding the fruit at 25°C. The most common method to precool berries is forced-air cooling, which is the most widely adaptable and fastest cooling method for small-scale operations. Cold air is forced to circulate rapidly through the containers (versus around the containers as in room cooling), allowing the cold air to be in direct contact with the warm berries. Pallets of strawberries are positioned so that the cold air must pass through the package openings and around individual berries. The most common design consists of a tunnel, which is formed by leaving space between two rows of loaded pallets, and covering the top and one end of the tunnel with a tarp. With the exhaust fan operating, air is removed from the tunnel and a slightly negative air pressure is created. Cold air from the room then flows through package openings and around warm berries to reach the tunnel. The cooling rate and efficiency of the system depend on a number of factors: 1) the temperature difference between the fruit and the cold air, 2) the air flow rate, 3) the accessibility of the fruit to the cold air, and 4) the dimensions of the air channel. An inefficient system will increase the cooling time, thus increasing the operating cost and reducing the marketable weight and quality of the fruit.

Storage Conditions

Optimum storage conditions for strawberries are 0°C and 90-95% relative humidity. In such conditions, strawberries can have 7-10 days of storage-life. However, storage-life is very dependent on the handling of berries during and after harvest. The highest freezing point is 0.8°C for strawberries, although berries with high soluble solids content are less likely to freeze. Generally, strawberries are not stored for extended periods of time. However, some temporary holding is often necessary to achieve orderly marketing. Holding berries under optimum storage conditions even during short marketing periods is beneficial to quality retention. Detrimental processes to berry quality are reduced at low temperatures, such as respiration, softening, moisture loss, and decay development.

Strawberries are subject to rapid water loss, causing them to shrivel and deteriorate, as well as causing the calyx to wilt and/or dry out. These symptoms will affect berry appearance before they affect eating quality. Water loss is governed by the vapor pressure deficit between the atmosphere and the product. The skin of a strawberry offers little protection to water vapor movement, and thus readily loses moisture to the surrounding air. Relative humidity of a storage room should be maintained at 90-95%, as strawberries will start to shrivel when stored below 90% relative humidity. However, excessive condensation of free water on the berries should be avoided.

Good sanitation of the storage and handling facilities is important to minimize contamination by decay pathogens. In addition, some molds growing in storage rooms can impart off-flavors to the stored berries. Therefore, any decayed or contaminated berries and containers should be removed and disposed of promptly, and storage rooms should be periodically cleaned and sanitized.

Modified Atmospheres

Modified atmosphere (MA) packaging or storage generally refers to enclosure within a sealed semi-permeable plastic film, in which the oxygen (O_2) is lower and/or the carbon dioxide (CO_2) is higher than the concentrations found in fresh air. Whole pallet covers or consumer packages for containment of the MA are commonly used. MA with 15-20% CO_2 and 5-10% O_2 reduces the growth of Botrytis cinerea (grey mold rot) and other decay causing organisms in strawberries. In addition, such MA reduces the respiration and softening rates of berries, thereby extending the postharvest life. However, exposure of strawberries to <2% O_2 and/or >25% CO_2 can cause off-flavors and brown discoloration, depending on cultivar, duration of exposure, and temperature.

The standard CO_2 treatment for strawberries is to completely enclose pallet loads of berries in sealed plastic bags, pull a slight vacuum, then add CO_2 to create a 12-15% CO_2 atmosphere within the bag and around the fruit. To prevent any accumulation of excess CO_2 by respiration, the amount of CO_2 produced by the respiring berries should balance with the bag permeability. Attention should be paid

to avoid puncturing the bags during handling. It is important that the berries are thoroughly cold prior to treatment, as the plastic pallet cover will impede further cooling and condensation can form when the fruit are not fully cooled.

Diseases

Diseases are the greatest cause of postharvest losses in berries. Prompt cooling, storage at the lowest safe temperature, preventing physical injury to the fruit, and utilizing high CO2 (10-15%) are the best methods for disease control. In addition, care should be taken to keep diseased or wounded berries out of packages, as rot can spread from diseased to nearby healthy berries.

Gray mold (*Botrytis cinerea*) is the most common problem in strawberries. This disease can develop during storage if berries have been contaminated though harvest and handling wounds. The organism can also invade flower blossoms and remain dormant in the berry until ripening begins. Gray mold is most serious during rainy or foggy periods in the field. Surface mycelia from infected berries can directly penetrate adjacent healthy berries to produce a nest of rotting berries. This nest can continue to enlarge and may spread throughout the basket or flat. Avoiding mechanical injuries and good temperature management are effective control measures. This fungus continues to grow at 0°C, albeit growth is very slow at this temperature.

Rhizopus rot (*Rhizopus stolonifer*) can also be a problem in strawberries. Cooling the fruit and keeping them below 5°C is very effective against this fungus, since it will not grow at these temperatures. Therefore, good temperature management can make it a less severe problem during storage and marketing, but it may cause severe losses in the field. Infected berries are soft and watery, and the fungus may produce long, whiskery growth on berries under high humidity conditions. Similar to gray mold, rhizopus rot can spread from infected berries to adjacent healthy ones, producing a nesting effect.

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(***Source**: Ontario Hort News, vol. 6, no. 13, June 8, 2006*)

There Might be Mites: Scouting and Management of Spider Mites in Strawberries and Raspberries

Pam Fisher, OMAFRA

Two-spotted spider mite outbreaks occur sporadically on strawberries and raspberries in Ontario. Because problems do not occur every year, or at every site, scouting really pays off for these pests. However, last week's heat wave was favourable for mite development. The time for one generation of mites to develop, from egg to mature adult, ranges from to 5 days at 24ºC to 3 weeks at 12ºC.

Damage first appears as flecking and stippling on the leaves. Because the mites overwinter near the base of the plant, older leaves closest to the ground are affected first. As populations build and leaves age or become damaged, mites move up the plant to newer, more succulent growth. Extensive feeding by mites causes leaves to turn yellowish or bronzed, and eventually dry and brittle. Fine webbing is evident on the lower leaf surface when populations are high.

Figure 1: Two-spotted spider mite adults and eggs. (*Photo credit D. Handley, University of Maine*)

Scouting technique: As you walk through the field, watch for early signs of damage from mites. Observe lower leaves for signs of flecking, stippling or off-colour. Stop every so often and examine leaves for mites. Use a hand lens and scan the lower leaf surface for mite adults, nymphs and eggs. Pay attention to the variety you are checking, populations may be building on some varieties more than others. Seascape strawberry and Autumn Britten raspberry are very susceptible to mites.

Sampling technique: If scouting indicates that mites are present, then sampling is required to estimate the population. Take a walk through the block and collect 50 leaves from the middle of the plant canopy. Don't collect the newest, succulent growth, and don't collect the old leaves next to the soil. Don't mix two or more varieties into the same unless you know that mites are building up on both varieties. Examine the lower leaf surface for all stages of mites, eggs, nymphs, adults. Record the number of mites per leaflet, as well as the presence of beneficial insects such as syrphid larvae, ladybird beetle larvae, and predatory mites. A leaflet is one trifoliate of the entire leaf.

Figure 2: TSSM damage to raspberries. Note bleaching and drying of lower leaves

In strawberries, a presence /absence technique can be used to reduce sampling time for mites. If 25% of leaflets have mites, the population is approx. 5 mites per leaflet. If 50% of leaflets have mites the population is approx. 20 mites per leaflet.

Thresholds for control: Several thresholds have been suggested for mite control on berries, ranging from 5-20 mites per leaflet. Consider these thresholds and apply miticides if damage is evident, and populations are increasing from week to week. Beneficial insects reduce the need for miticides. There are several miticides available for strawberries and raspberries. Apply each product when most mites are at a susceptible stage for that product (Table 1). Use different products from year to year to prevent the development of resistance.

Biocontrol: Predatory mites which feed on spider mites are available from commercial suppliers, and have been used successfully on both strawberry and raspberry plantings. Amblyseius species are more likely to survive in field conditions. Persimillous is better in greenhouse conditions. Beneficial mites must be introduced before large populations of spider mites develop, but after insecticides for tarnished plant bug have been applied. Pyrethroids (Decis, Matador, Cymbush, Ripcord) and Thiodan are toxic to beneficial mites.

Table 1: Miticides for use on strawberries and raspberries in Ontario

Product	Stage of mite controlled	Comments	Crop specific registrations – Strawberries	Crop specific registrations - Raspberries
Apollo SC	Eggs, very young nymphs	Should be applied when most mites are in the egg stage. This miticide works best if applied early in the season, when generations tend to be most synchronous.	Use before harvest. Days to harvest interval =15 days	Use before harvest. Days to harvest interval = 15 days
Kelthane 50W	Nymphs	An older product. This miticide works slowly; do not expect rapid knockdown of mites, especially in cool weather Resistance to Kelthane has developed where it has been used repeatedly, but still works well on most berry crops.	Use before or after harvest. Days to harvest interval = 7 days	Use before or after harvest Days to harvest interval = 7 days
Agri-Mek 1.9% EC	Adults, nymphs	Translaminar (locally systemic). Absorbed best by new, expanding leaves.	Use after harvest only. Days to harvest interval = 300 days	Use after harvest only
Pyramite	Adults, nymphs	A contact miticide providing rapid knockdown of adults and nymphs.	Use before or after harvest. Days to harvest interval = 10 days	Use after harvest only.

(**Source**: Ontario Hort News, vol. 6, no. 13, June 8, 2006)

RASPBERRY

Monitor for Orange Rust in Brambles

Annemiek Schilder, Michigan State University

This is a good time to check blackberry and black raspberry plantings for orange rust. Red raspberries are immune. Characteristic symptoms are spindly shoots with clustered, misshapen, pale green to yellowish leaves, as well as bright orange, powdery blisters on the undersides of leaves. Before the blisters burst open, they look waxy or shiny, as if covered with lacquer. On black raspberries, the rusted leaves start to wither and drop in late spring to early summer. New leaves produced towards the tips of canes may appear normal, giving the impression that the plant has "grown out" of the disease. However, such canes will remain infected and will produce a mass of spindly shoots with no blossoms the following spring. The plant becomes systemically infected and remains so for the rest of its life. Orange rust does not usually kill plants, but it can significantly reduce vegetative growth and yield. The disease can be caused by either of two closely related fungi, *Arthuriomyces peckianus* or *Gymnoconia nitens*. The orange spores are spread by wind and can infect leaves of healthy plants with long periods of leaf wetness provided by rain or dew. Orange rust is favored by relatively low temperatures (50 to 70ºF). The fungus overwinters in the crown and roots of infected plants, leading to the production of new infected canes every year.

Cultural control

While there were no chemical control options for this disease in the past, we now have several excellent fungicide options. This does not mean that we should abandon cultural practices, such as establishing new plantings from disease-free nursery stock, which will also help in avoiding virus diseases. If any plants show signs of the disease during the spring in which they were planted, this means there were already infected at the time of planting. Upon inspection of plants each spring, any infected plants, which are economically worthless, should be dug up and destroyed promptly before rust pustules mature and spores are liberated. The location of those plants should be clearly marked, and any new suckers arising from root pieces left in the ground should be removed and sprayed with an approved systemic herbicide. It is also prudent to remove infected wild brambles in nearby wooded areas and fence rows. Management practices that improve air circulation, such as thinning out canes within the row, pruning out floricanes immediately after harvest, and effective weed control aid in disease control by reducing build-up of moisture in the planting. Some blackberry cultivars (e.g., Eldorado, Raven, and Ebony King) are reported to be resistant to orange rust, but no black raspberry cultivars are known to be resistant.

Fungicide options

The best fungicide options are Nova (myclobutanil), Pristine (pyraclostrobin + boscalid) and Cabrio (pyraclostrobin). While Abound (azoxystrobin) is labeled for use on brambles, it does not have orange rust (or any other rust for that matter) on the label. Nova may have a bit better curative activity than the others because of its greater systemicity, which would make it the material of choice during or after a rainy period with inoculum already being present. Each of the above-mentioned fungicides will also control various other cane, leaf and fruit diseases. Since Pristine has two active ingredients, it has the broadest spectrum of activity. None of these fungicides will cure an already infected plant. However, they can prevent healthy plants from becoming infected. Since infected plants will continue to be sources of inoculum over their lifetime, it is best to remove and destroy them altogether and replace them with healthy plant material from a reputable nursery. Apply fungicides upon first discovery of the blisters, preferably before they burst open and release spores. If the field has a history of the disease, sprays should be initiated before blisters appear. Since infections can also originate from wild brambles near the field, one should keep an eye on these as well if possible. (***Source**: Michigan Fruit Crop Team Advisory, Vol. 21, No. 8, May 30, 2006*)

BLUEBERRY

Post-emergent Herbicides for Blueberries

Eric Hanson, Michigan State University

Several post-emergent herbicides are labeled for use in Michigan blueberries. Most can be useful as spot-treatments to control weeds in problem areas of fields. Each herbicide has different characteristics that need to be considered when making choices.

Aim, Gramoxone and Rely are burn-down materials. They kill treated plant parts, but do not move within the plant. As a result, perennial weeds are usually not killed because the chemical does not move to the roots. Rely may move slightly in plants, because it often provides a little better control of some herbaceous perennials, such as dandelion. Aim is relatively inexpensive, but does not control grasses. Rely is much more expensive, but controls broadleafs and grasses. All three herbicides kill green bark and leaves of blueberries, so take care to keep spray off blueberries.

Fusilade and Poast are selective grass killers; they have no effect on bloadleaf weeds or blueberries. Application time is critical for control. Grasses must be treated when they are 4-8 inches tall in the spring. If grass is taller, control is poor. These materials are often useful to control quackgrass or annual grasses in young plantings.

Roundup and Touchdown (glyphosate) are the most effective postemergent herbicides for blueberries, but also the most hazardous. These chemicals are absorbed by green tissues and move throughout the plant. Perennial weeds are killed because the chemical moves to below-ground plant parts. Translocation is a two-edged sword. Glyphosate applied to blueberry branches moves within the bush, and can kill large canes or whole bushes. The most effective time to treat perennial weeds is late in the summer because absorbed glyphosate tends to move down to the roots. This timing is also most hazardous for blueberries. Use extreme care to avoid contact with blueberry tissues. (***Source**: Michigan Fruit Crop Advisory Team Alert, ol. 22, No. 10, June 12, 2007*)

Post-bloom Management of Fruitworms in Blueberry

Rufus Isaacs and John Wise, Michigan State University

With blueberry bloom almost complete in Michigan, grower insecticide options for fruitworm control expand. Monitoring traps have detected increasing catches of cranberry fruitworm in the past week across southwest Michigan, and our scouting on Monday found fresh cherry fruitworm eggs in Van Buren and Ottawa counties. This emphasizes the need for protecting fruit from fruitworm infestation in the weeks after bloom. Once bees are removed from the fields, broad spectrum insecticides can be used.

Guthion, Imidan, Lannate, Asana, Danitol and Sevin are effective broad-spectrum insecticide options available to blueberry growers. With all these products, maintaining good coverage is still important to get residue to the parts of the berry where fruitworms are found: within the calyx cup of the berry where eggs are laid, and also at the stem end where cranberry fruitworm larvae tend to enter berries. Use enough water and consider spray additives to help spread the material across the berry surface.

EPA's phase-out for Guthion will remove this insecticide from blueberry production by the end of 2012. Given the current reliance on this chemical for fruitworm control, it would be wise for growers to gain experience with alternatives on a portion of their fields now so that an effective program is in place when Guthion is completely restricted.

Some selective insecticides, like Confirm, SpinTor, Entrust and *Bts* might also be useful after bloom (See the **Michigan Fruit Management Guide**, MSU bulletin E-154 for specific recommendations for each). Recent research trials in Michigan have demonstrated that Confirm® applied after bloom to fields with low or moderate fruitworm pressure can also achieve control of these pests. This insecticide has the benefits of minimal negative impact on natural enemies such as parasitic wasps, ladybeetles and lacewings, plus long residual activity because of resistance to wash-off and ultraviolet breakdown.

Correct timing and coverage are critically important for fruitworm control, so regular scouting of fields, use of sufficient spray volume to get good fruit coverage and selecting appropriate spreader-stickers can maximize the increase activity of most insecticides applied for fruitworm control. (***Source**: Michigan Fruit Crop Advisory Team Alert, Vol. 22, No. 9, June 5, 2007*)

GRAPE

Disease Control in Grapes Critical During and After Bloom

Annemiek Schilder, Michigan State University

The bloom and post-bloom period is a critical for disease control in grapes, as the young clusters are highly susceptible to diseases, including black rot, downy mildew, powdery mildew and Phomopsis. The risk is especially great if we have a lot of rain and moderate to warm temperatures during this time. Cool, wet weather during bloom can also allow Botrytis to get a foothold in the clusters of susceptible varieties by promoting growth on senescing flower parts.

The main aim for fungicide sprays at this time is to protect the clusters from infection by these pathogens, while simultaneously protecting the foliage as well. Some infections that occur during this period may remain dormant (invisible) until the berries are close to veraison (black rot) or ripen (Phomopsis, Botrytis). As the berries mature, they become naturally resistant to new black rot, downy mildew, and powdery mildew infections and the need for protection diminishes. This happens quite rapidly (two to three weeks after bloom) for downy mildew, three to four weeks after bloom for powdery mildew and four to five weeks after bloom for black rot. Some wine grape varieties remain susceptible to black rot a couple of weeks longer than Concord grapes.

However, be aware that the cluster stem (rachis) and especially the berry stems can remain susceptible longer than the berries in most cases. The only disease to which berries remain susceptible throughout their development is Phomopsis, but the risk of infection diminishes after bunch closing because spore release drops off then. Botrytis is more of a risk late in the season as the clusters become more susceptible after veraison, especially in tight-clustered varieties. In general, aim to protect the clusters from the major diseases from immediate pre-bloom until four to five weeks after bloom. If cluster development is variable, make sure that the latest developing clusters have caught up before easing up on the spray program.

Black rot

Temperatures in the high 70's and low 80's are perfect for black rot. At these temperatures, only six to seven hours of wetness are needed for infection. Black rot is a tricky disease in that infections can remain latent (dormant) for a long period of time, so you won't know that you have the disease until is it too late to do anything about it. Infections can take place anytime from bloom onwards, but only become apparent at or shortly before veraison. Grape berries are highly susceptible to black rot infection for the first two to three weeks after bloom. Then they become progressively less susceptible as they develop, finally becoming highly resistant about four to eight weeks after bloom depending on the variety and year. In general, Concord berries become resistant to infection about four to five weeks after bloom, while some *V. vinifera* cultivars don't become fully resistant until weeks after bloom. Thus, the period from immediate pre-bloom through early fruit development is crucial to protect grapes against black rot infection.

In five years of trials in New York, good black rot control was achieved with one immediate pre-bloom and one to two post-bloom fungicide sprays. The second post-bloom application is strongly advised if black rot has been a problem in the vineyard the previous year, and should be considered prudent if wet weather is anticipated. During three years of fungicide trials in a 'Concord' vineyard in Fennville, Michigan, just two post-bloom applications of SI fungicides have provided very good control under high black rot pressure. An immediate pre-bloom application is advised only if black rot was severe in the vineyard in question in previous years.

Sterol-inhibitor fungicides (e.g., Nova and Elite) continue to provide outstanding control of black rot, and provide several days of post-infection activity. When using SI fungicides on a post-infection schedule, use the highest label rates because post-infection activity is strongly rate-dependent, particularly when extended "kickback" activity is required. The strobilurin fungicides (Abound, Flint, Sovran, Pristine) are excellent protectants but provide only limited post-infection activity (probably <24 h). Flint and Pristine should not be used on Concord grapes because of potential phytotoxicity.

Phomopsis

Cane and leaf lesions have been showing up in vineyards. The extended rainy period that we are currently experiencing is conducive to infection. Phomopsis spores were also plentiful in a Niagara vineyard in rainwater collected in mid-May, so the potential for infection is certainly there. Each rainfall event will lead to spore dispersal and can also lead to infection if the tissue remain wet for a sufficient amount of time. The optimum temperature for infection is 59-68ºF, at which time about 6 to10 hours of wetness are needed for infection. The longer the tissue stays wet, the more severe the symptoms will be. Since rachis and flower clusters are now fully

exposed, we should be concerned with preventing Phomopsis infection of the rachis and fruit, especially in mechanically pruned vineyards and vineyards with a history of the disease. Rachis infections are most closely correlated with yield loss.

If at this time you find a lot of lesions on the leaves and canes, infection pressure will be high for the fruit also. Best fungicide options for control of Phomopsis during and after bloom will be Abound, Sovran or Pristine (do not use Pristine on Concord grapes). Phosphorous acid fungicides, such as ProPhyt and Phostrol, are also good and cost-effective alternatives. These are systemic and will most likely provide some kick-back activity. In trials done in Michigan, ProPhyt provided very good control of Phomopsis when sprayed on a 14-day schedule. Tighten the schedule and increase the rate if disease pressure is high. Ziram is a moderate to good protectant against Phomopsis and can be a tank-mix partner with any of the phosphorous acid fungicides. EBDC fungicides are good protectants, but cannot be applied after bloom has started in grapes grown for the National Grape Cooperative. EBDC's have a 66-day pre-harvest interval.

Powdery mildew

No powdery mildew has been sighted in vineyards yet. However, we have had several occasions for primary ascospore release this spring. Ascospore discharge is initiated in the spring if 0.10 inch of rain occurs at an average temperature of 50ºF or more. This results in thorough wetting of the bark where the cleistothecia have overwintered. When the cleistothecia are sufficiently wetted, infectious ascospores are discharged within four to eight hours and are carried by wind to susceptible plant tissues. They can infect any green surface on the developing vine and do not need water for infection. The fungus then grows on the plant surface and produces a second type of spore (conidia), which are windborne and cause secondary infections. Under optimal conditions, the disease can spread rapidly, as the time from infection to production of conidia can be as short as seven days. Although infections can occur at temperatures from 59 to 90ºF, temperatures between 68 and 77ºF are optimal for disease development. Temperatures above 95ºF inhibit spore germination, and the fungus may be killed at temperatures above 104ºF.

Berry age has a marked effect on susceptibility to powdery mildew. Researchers in New York showed that when clusters of 'Chardonnay', 'Riesling', 'Gewürtztraminer', and 'Pinot noir' were inoculated from pre-bloom to six weeks post-bloom, only fruit inoculated within two weeks of bloom developed severe powdery mildew. Berries became substantially resistant to infection by three to four weeks after bloom, resulting in diffuse, non-sporulating colonies on berries, and were virtually immune at six to eight weeks after bloom. Also, rachises of 'Chardonnay' and 'Riesling' fruit clusters developed severe powdery mildew when inoculated at bloom, whereas rachises inoculated 31 days after bloom developed only trace levels of powdery mildew. Therefore, early sprays (from immediate pre-bloom until three to four weeks after bloom) are critical for preventing powdery mildew on the clusters. This usually coincides with critical sprays for black rot.

Sulfur remains an effective and inexpensive protectant fungicide for powdery mildew control in non-sulfur-sensitive grape varieties. The most effective systemic fungicides for powdery mildew control are the sterol inhibitors (Nova, Elite, Vintage, etc.) and the strobilurin fungicides (Pristine, Sovran, Abound and Flint). Luckily, we do not have any reports of fungicide resistance to strobilurins in the powdery mildew fungus in Michigan, but in some vineyards where sterol inhibitors have been heavily used for many years, they appear to be less effective than they used to be. New fungicide options that provide excellent control of powdery mildew are Quintec and Endura. Therefore, it would be best to not entirely rely on SI's during the most critical period for fruit infection (immediate pre-bloom until three weeks after bloom), but alternate or tankmix with other effective fungicides.

Downy mildew

Downy mildew primary infections start if rains occur (at least 0.4 inches) and temperatures are above 50ºF over a 24-hour period. Check the recent weather conditions at your location on the **MSU's Enviro-weather** website. I think in many locations, the most recent conditions certainly qualify as a primary infection period for downy mildew. It takes 7 to 12 days for the lesions to form after infection has taken place, so keep an eye out for downy mildew. Early in the season, downy mildew lesions may be confused with low-concentration Gramoxone and possibly Chateau herbicide injury, which also cause yellow spots on leaves. However, if no herbicide was used and no herbicide spots are present on lower leaves, the spots may be downy mildew. Look for white sporulation on the underside of the leaf.

A spray for downy mildew at this time is recommended for susceptible varieties, especially in vineyards with a history of disease. Severe downy mildew infection can result in premature defoliation of the vine. Ridomil Gold MZ and Ridomil Gold Copper have excellent curative and protectant activity against downy mildew. Under moderate infection pressure, they will provide three to four weeks of protection.

Of the strobilurins, Pristine, Abound, and Sovran are good choices. Other effective fungicides are mancozeb, ziram, and fixed coppers. ProPhyt and Phostrol are also good alternatives: they provide excellent curative action and about 7 to10 days of protective activity. Under high disease pressure or when spraying after an infection period, use higher rates. (***Source**: Michigan Fruit Crop Advisory Team Alert, Vol. 22, No. 9, June 5, 2007*)

General Information

Brown Mmarmorated Stink Bug Found in Massachusetts

Julie Callahan, Mass Dept. of Ag. Resources

Western conifer seed bug adult *Leptoglossus occidentalis* *David Cappaert, MSU, www.insectimages.org*

The Brown Marmorated Stink Bug (*Halyomorpha halys*) was found for the first time in Massachusetts in March 2007. The insect was collected by a homeowner in Bridgewater (Plymouth County). The brown marmorated stink bug (BMSB) was also reported from a Rhode Island home in April this year.

This insect, a native to Asia, was first found in Allentown, Pennsylvania in 1998. Since that time the BMSB has been discovered in New Jersey, Oregon, Maryland, South Carolina, Virginia, and Delaware. This insect is an excellent hitchhiker and may have moved to the US in packing crates from Asia. While adult insects can fly, their spread can be aided by hitchhiking in vehicles or containers. In Maine the BMSB was found in November in new RVs being shipped from an infested county in Maryland. I also witnessed BMSB hitchhikers squashed on an educational exhibit that had recently been in Pennsylvania.

The BMSB attacks a long list of hosts including fruits (apple, peach, pear), ornamentals (*Paulownia,* butterfly bush, honeysuckle, Norway maple), and vegetables (beans). Their feeding causes small necrotic areas on leaves and fruit but can also cause "cat-facing" on fruits rendering them unmarketable. BMSB is a nuisance species that invades homes in the fall much like its relative the western conifer seed bug.

A few characters that help identify the adult BMSB are its shield-shaped body, white bands on the antennae, and alternating white and dark bands on the rear edge of the abdomen. For photographs and more information see the MA fact sheet: http://massnrc.org/pests/pestFAQsheets/brownmarmoratedstinkbug.html
The western conifer seed bug (*Leptoglossus occidentalis)* has flattened hind legs and no banding on its antennae. These characters will also help you to distinguish this bug from the new invader on the scene, Brown Marmorated Stink Bug. For photographs of bugs that look similar to the BMSB see the Rutgers website: http://njaes.rutgers.edu/stinkbug/similar.asp

If you suspect you have found a Brown Marmorated Stink Bug, please collect the insect in a container and report it via the plant pest hotline (617.626.1779) or on our website (http://www.massnrc.org/pests). If you have access to digital camera and can send a photo of the specimen you captured via our on-line pest reporting, that would be ideal.

Brown Marmorated Stink Bug Adult *Halyomorpha halys* *David R. Lance, USDA APHIS PPQ, www.insectimages.org*

Upcoming Meetings:

June 20, 2007 - UMASS TURF RESEARCH FIELD DAY - , Joseph Troll Turf Research Center, South Deerfield, MA. Field Day 2007 will focus on the research currently taking place at the Joseph Troll Turf Research Center as well as on research being conducted at

other locations by University of Massachusetts Turf Program faculty, staff, and graduate students. For attendee/exhibitor registration information, visit: www.umassturf.org/education/annual_events/field_day.html

July 12, 2007 - SUMMER MEETING OF THE MASSACHUSETTS FRUIT GROWERS' ASSOCIATION, INC. IN COOPERATION WITH THE UMASS FRUIT PROGRAM – Bolton Orchards, Bolton, MA For complete information, see http://www.umass.edu/fruitadvisor or http://www.massfruitgrowers.org.

July 12, 2007. *Small Fruit Tour***,** Germantown, NY. Currants, Gooseberries, Brambles, Mountain Range Farm. For more information contact Kathy Heidenreich at mcm4@nysaes.cornell.edu .

July 18, 2007 - SUMMER MEETING & TRADE SHOW of the Massachusetts Nursery Landscape Association (MNLA) and Massachusetts Flower Growers Association (MFGA) in cooperation with the UMass Extension Floriculture, Landscape, Nursery and Urban Forestry Programs - Tower Hill Botanic Garden, Boylston, MA To register go to www.mnla.com or call 413-369-4731.

July 19, 2007. *Small Fruit Twilight Tour***.** NYS Agricultural Experiment Station, Geneva, NY. Black and Red Raspberries, For more information contact Kathy Heidenreich at mcm4@nysaes.cornell.edu .

July 24, 2007 - 4-7 PM Foppema's Farm Northbridge, MA UMASS VEGETABLE IPM FIELD SCHOOL. Cost $20. For more information, go to http://www.umassvegetable.org/ed_programs/meetings/winter_meetings.html or call Ruth Hazzard at 413-545-3696 or email rhazzard@umext.umass.edu

July 25, 2007. *Summer Fruit Tour.* NYS Agricultural Experiment Station, Geneva, NY. Cordon training of Ribes, Ribes disease control, small fruit insect research updates. For more information contact Kathy Heidenreich at mcm4@nysaes.cornell.edu .

August 2, 2007. *High Tunnel Small Fruit Tour*, Ithaca, NY. Black raspberries, Blackberries, Cornell University College of Agriculture and Life Sciences. For more information contact Kathy Heidenreich at mcm4@nysaes.cornell.edu .

August 8, 2007 - 4-7 pm Golonka Farm Hatfield, MA UMASS VEGETABLE IPM FIELD SCHOOL. Cost $20. For more information, go to http://www.umassvegetable.org/ed_programs/meetings/winter_meetings.html or call Ruth Hazzard at 413-545-3696 or email rhazzard@umext.umass.edu.

August 10-12, 2007 - NORTHEAST ORGANIC FARMING ASSOCIATION (NOFA) 33 rd ANNUAL SUMMER CONFERENCE – "A CELEBRATION OF SUSTAINABLE LIVING" at Hampshire College in Amherst, MA. For the full schedule of activities and further information go to www.nofamass.org, or contact Julie Rawson at at (978) 355-2853 or julie@nofamass.org.

August 14-15, 2007. *NASGA Summer Tour*, Niagara Falls Canada and Niagara region of New York. See news brief below or for more information contact Kevin Schooley at kconsult@allstream.net or visit www.nasga.org .

August 15, 2007 4-7 pm Paradise Hill FarmWestport, MA UMASS VEGETABLE IPM FIELD SCHOOL. Cost $20. For more information, go to http://www.umassvegetable.org/ed_programs/meetings/winter_meetings.html or call Ruth Hazzard at 413-545-3696 or email rhazzard@umext.umass.edu

August 21, 2007 - AGRICULTURE RESEARCH DAY - 4-7 pm UMass Crops Research and Education Center, South Deerfield, MA. Hear about the latest research on a wide range of topics in vegetable crops, cover crops and crops for fuel! Join us to celebrate the new equipment workshop being built by the College of Natural Resources & the Environment to support research at South Deerfield. Bring disease samples to a free onsite diagnostic clinic! Registration: $20 per person (3 or more per farm, $15 per person). Refreshments will be served. Pesticide recertification credit has been requested. For more information contact Ruth Hazzard (545-3696) rhazzard@umext.umass.edu or Steve Herbert (545-2250) sherbert@umext.umass.edu.

August 21, 2007 - ANNUAL MEETING of the CAPE COD GROWERS' CRANBERRY ASSOCIATION 9am - 1pm - UMass Cranberry Experiment Station, Wareham, MA. In addition to the business meeting, there will be a tradeshow, lunch, and a tour and ribbon-cutting ceremony for the newly renovated State Bog. Lunch tickets must be purchased in advance. For further information contact CCCGA at 508-759-1041 or e-mail info@cranberries.org

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