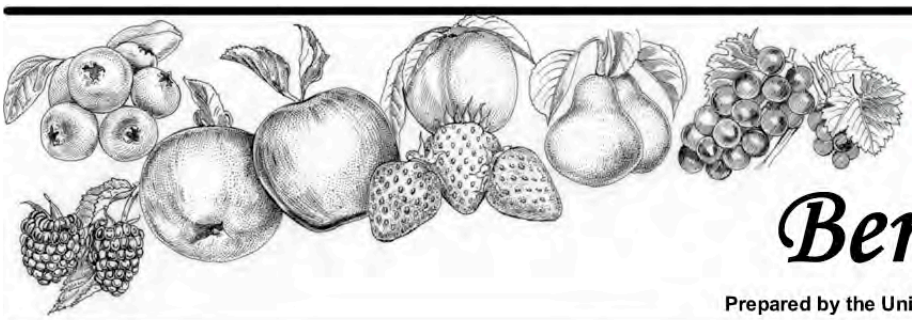

UMassAmherst EXTENSION

Berry Notes

Prepared by the University of Massachusetts Fruit Team

July 2007 Vol. 19, No. 11

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:

Strawberry harvest is complete in most locations. Most growers report an outstanding harvest season. Renovation is underway. Keep renovated fields as well as new plantings regularly irrigated. Fertilization and irrigation are important for good canopy regrowth. Watch for cyclamen mite infestations. Pull blossoms and set runners on new plantings. Also, check new fields for evidence of potato leafhopper burn and evaluate older fields for the level of foliar diseases. This week's issue contains information on leaf tissue testing which is an important activity after renovation. **Highbush Blueberry** harvest is underway. Fruitset looks very good and good yields are expected. Leaf samples can be taken for tissue analysis from now to mid August to determine nutrient status of the bushes. This is especially important for blueberries since soil tests are not a reliable check on adequate nutrition. Also, be sure to keep you blueberries well watered during the coming weeks to help bushes sustain their fruit-load and go into the winter free from water stress. **Summer raspberry** harvest is also underway. Intermittent rain can cause increases in fruitrot during harvest. See below for management recommendations. Be on the lookout for Orange Rust on black raspberries and blackberries. Also keep an eye out for symptoms of fireblight in raspberries. Conditions have been very favorable for Fire Blight in apples this season and this may also be true for raspberries. **Grape** clusters are sizing up. Scouting for disease and insect levels and taking corrective action are important activities before bunch closure. Leaf pulling and cluster thinning are helpful to suppress disease potential. Mite infestations can build up quickly at this time of year. Be sure to check the underside of your leaves. **Currants and Gooseberries** harvest continues although the extreme heat has caused some fruitdrop. Some foliar diseases are evident now and should be controlled. Twospotted spider mites may also be building up.

ENVIRONMENTAL DATA

The following growing-degree-day (GDD) and precipitation data was collected for a oneweek period, June 28, 2007 through July 11, 2007. Soil temperature and phenological indicators were observed on or about July 11, 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 (2-Week Gain)
	2-Week Gain	Total accumulation for 2007		
Cape Cod	264	1,086	78˚F	2.15"
Southeast	280	1,105	78˚F	n/a"
East	261	1,174	79˚F	1.10"
Metro West	292	1,140	76˚F	1.10"
Central	276	1,026	68˚F	2.12"
Pioneer Valley	276	1,137	74˚F	1.13"
Berkshires	294	1,054	78˚F	2.26"
AVERAGE	278	1,103	76˚F	1.65"

n/a = information not available

(***Source**: UMass Extension 2007 Landscape Message #19, July 13, 2007*)

STRAWBERRY

Cyclamen Mites on Strawberry

Alan Eaton, University of New Hampshire

Shortly after renovation is the easiest time to see cyclamen mite injury, and the most effective time for control. Cyclamen mites are deep down in the crowns, feeding on the just-forming and opening leaf tissues. New leaves emerge as twisted, distorted, stunted, often purplish. When I see this, I ask myself if it could be herbicide injury. It is easy to confuse the two. The pattern in the field provides a good clue to distinguish the two. If injury is spotty; a plant here then there, then a skip… that suggests cyclamen mite. If damage is along entire rows (or the entire bed), that suggests herbicide injury to me.

One way to confirm cyclamen mires is to examine the crown under a microscope. For someone trained, with really good eyes and good light, 20X magnification **might** be enough. For me, I need a microscope. The mites are very tiny, oval shaped things, straw-colored. Yes, I mean tiny. An adult two-spotted spider mite is about ½ millimeter long. An adult cyclamen mite is about ¼ millimeter long. Since there are 25.4 millimeters to the inch, that's tiny.

I'll include control information now, lest I forget in the July issue. The reason post-renovation is the easiest time to control these is that you have to get the pesticide to run deep into the crowns, where the mites live. That means high gallonage, a wetting agent, and enough pressure to get good foliar agitation are required. Labels usually list 400 gallons per acre as the recommended rate of water. Both Kelthane and Thionex are registered. One properly done application should do it. (***Source**: UNH IPM Newsletter, Vol. 12, No. 6, June 27, 2006*)

Leaf Tissue Sampling

Sonia Schloemann, UMass Extension

Leaf tissue analysis is a way of determining the actual nutritional status of plants. It is an excellent and inexpensive way of finding out if your fertilization program is working or if changes need to be made. The analysis provides information on foliar N, P, K, Ca, Mg, Mn, Fe, Cu, B and Zn levels for the leaves sampled and recommendations for corrective measures if needed. Combined with soil testing, leaf tissue analysis can help pinpoint the source of problems and determine what measures may be needed to ensure proper nutrition of the crop. For strawberries sample from the first fully expanded new leaves after renovation. Collect 30 - 50 leaves per sample. Sample different varieties separately, if possible. Collect leaves from as many plants as possible in the sample area. Remove the petioles (leaf stems) from the leaves. Gently wash the leaves in tap water to rinse off soil or spray residue. Allow the leaves to air dry until they are brittle before placing into a paper bag. The cost per sample is $20. A check made out to *the University of*

Massachusetts must be sent in with the sample. Send sample(s) to the Soil and Plant Tissue Testing Lab, West Experiment Station, Box 38020 UMass, Amherst, MA 01003 or call (413) 545-4768. Test results will be accompanied with recommendations. Go to http://www.umass.edu/soiltest/ for more information on soil and tissue testing services at UMass.

Root Weevils in Strawberries: Recognize The, Take Action

Pam Fisher, Ontario Ministry of Agriculture and Food

Root weevils can be a serious pest on strawberries. Damage can be extensive; a pocket of damage in a corner of the field can expand and cause devastating losses the following year. Recognizing root weevils and their damage is the first step in preventing this problem. Unfortunately, control is difficult and there are few pesticide options.

The following photos can help you identify root weevils and their damage in the field. There are many good internet sources that provide details on life cycle and biology of these pests.

Important facts that affect control

• Root weevil larvae feed on plant roots and crowns. Like most soil born insect pests, there are no labeled insecticides for control of larvae, and very few even being investigated.

• There are several species of root weevils, including the black vine weevil and the strawberry root weevil. They have similar life cycles and habits.

• Root weevils have a wide host range: Japanese yew; hemlock; white cedar; pine; spruce; Euonymus; Rhododendron; grapes and berries. They generally move onto a field from the edges.

• Root weevils can't fly. They walk from crop to crop. Expect them to travel short distances when food is available, but longer distances (several hundred feet) if they need to search for new food sources. Barriers and inhospitable conditions will slow migration to new fields.

• Root weevil adults hide in strawberry crowns and plant debris during the day, and feed mostly at night. • Adults feed on strawberry foliage. The notches and semi-circles cut out of the leaf edge is characteristic. The injury alone is not serious, but it indicates a potential problem with the larvae next year.

Figure 1: *Adult root weevil. There are several*

Figure 2: *Root weevil larvae: these larvae, pinkish white in colour, can be found in spring on strawberry plant roots. They are small, only 1/2- 1 cm in length.*

Control of root weevils

• To suppress root weevils, apply an insecticide labeled for root weevil adults in strawberries. Spray after strawberry renovation, at night, when adults are most active. Renovating the field first will help to expose the adults. Adult weevils are hard to kill. They are secretive. They emerge and are active over extended periods of time. Their body design does not lend itself to control with contact insecticides.

• Strawberry renovation practices should include rototilling. Where weevils are a problem, do not narrow the rows with gramoxone, because the plant debris and undisturbed soil will favour weevil activity.

• Never plant new fields adjacent to older plantings.

• Disc infested fields under as soon as possible after harvest, but leave a trap row or two of the old planting at the edge of the planting to prevent mass exodus from the field.

Figure 3*: Larvae are legless, with a brown head capsule.*

Figure 5*: Overview of field with root weevil damage. The problem started at the field edge.*

Unconventional attempts to control root weevils:

• Consider barriers or trap crops that will prevent weevils from moving to the new fields. We think that the plastic lined trenches used for Colorado potato beetle might work.

.

• Researchers are focusing on use of beneficial nematodes to control root weevil larvae. The beneficial nematodes are available commercially.

Figure 6*: Leaf notching on strawberry leaves caused by adult weevil feeding.*

They must be applied with great care and at specific timings in order to survive the application process and reach the weevil larvae, which they infect.

• A grooved board has been developed to capture and collect adult weevils. Using traps like this could be used to monitor migration of weevil larvae to new fields. **(*Source:*** *Ontario Berry Grower, Vol. 7, July 2003*)

Exclusion Barriers for Management of Black Vine Weevil, *Otiorhynchus sulcatus*, in First Year Strawberries

J.H. Tolman, et al, Agriculture and Agri-Food Canada, and Pam Fisher- Ontario Ministry of Agriculture and Food

Introduction

Black vine weevil (BVW), *Otiorhynchus sulcatus* (F), thought to be a native of northern Europe but known in North America since 1835, feeds on a tremendously varied number of different plant species, including strawberry. While adults (Figure 1b), feeding mainly at night, cut characteristic notches in leaf margins (Figure 2a), economic injury is due to feeding by larvae (Figure 1a) on roots (Figure 2b). Small larvae feed mainly on smaller roots while larger larvae move to larger roots which may be girdled when BVW populations are high. Severely damaged plants wilt and may even die, thinning strawberry stands (Figure 2c) and ultimately reducing yields. In Ontario, the profitable life-span of strawberry fields heavily infested with BVW may decline from 3-4 years to two years or less.

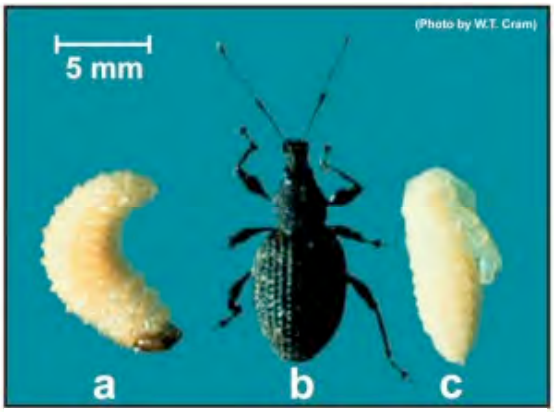

Figure 1*: Life stages of black vine weevil: a - larvae; b - adult; c - pupa*

Objective

Adult BVW cannot fly but are very active walkers, moving readily from hedgerows or infested fields into newly planted strawberries. During the summer of 2005, a research project initiated by Agriculture and Agri-Food Canada under the Risk Reduction Strategies Initiative investigated the potential of exclusion barriers to reduce BVW immigration into newly planted fields in Ontario.

Methods

In early July exclusion barriers of two designs (Figure 3a) were established near Campbellville, ON, between an infested

plantation scheduled for destruction and a block of strawberries (cv. Jewel) planted in May 2005. "Vernon" barriers consisted of linked 3 m lengths of extruded black plastic designed to capture BVW. "Sheet" barriers consisted of a 30 cm sheet of plastic (Polytarp - supersix® with one edge buried 5-10 cm in the soil and the remainder supported vertically by stapling to 2 x 4.5 cm x 50 cm tall wooden stakes spaced 2 m apart down the length of the barrier. Collection pails (4 L ice cream pails), containing 2 L of saturated saline + 4 ml liquid soap, were located at both ends of each barrier (Figure 3b). Captured BVW were collected and counted each week (Figure 3c).

***Figure 2**: Strawberry injury by black vine weevil: a - notches cut in leaves by adults; b - feeding by large larva on crown; c - plant stand in left rows reduced by larval feeding; beneficial nematodes applied to right rows previous year.*

***Figure 3**: Exclusion barriers in field: a - "Vernon" barrier in background; "Sheet" barrier in foreground; b - collection pails; c - collecting captured insects.*

Observations

Not until the 3rd collection after discing were significant numbers of BVW captured moving into the new strawberry planting. BVW numbers thereafter rose steadily until mid Sept. (Figure 4). By 19 Sept a total of 737 adult BVW had been collected moving around the "Sheet" barriers, an average of 20 BVW/m barrier. "Vernon" barriers were not as effective as "Sheet" barriers and tended to warp and lift from the soil due to solar heating.

Recommendation

Growers unable to plant new blocks of strawberries >500 m from a planting heavily infested with BVW should establish an maintain a continuous "Sheet' barrier between the infested field and the new block (Figure 5). While all immigrating BVW will not be excluded from the new block, each intercepted BVW represents a reduction of as many as 500 eggs in the new plantation. (***Source**: New York Berry News, Vol. 5, No. 6, June 19, 2006*)

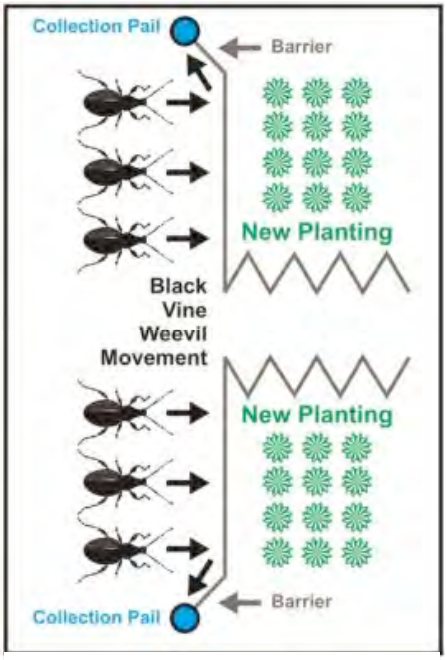

***Figure 5**: Suggested placement of exclusion barrier to manage adult black vine weevil immigrating into new strawberry planting.*

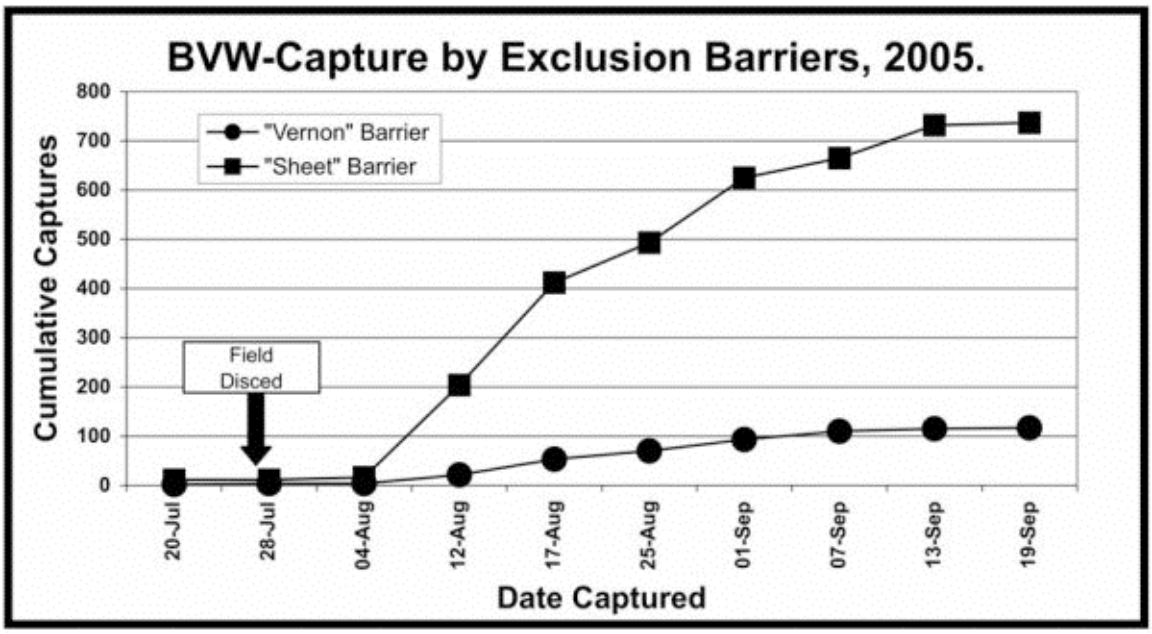

***Figure 4**: Cumulative capture of immigrating, adult black vine weevils by exclusion barriers, Campbellville, ON 2005.*

RASPBERRY

Battling Botrytis in Fall Raspberries

Annemiek Schilder, Michigan State University

Botrytis gray mold, caused by the fungus *Botrytis cinerea*, is one of the most important diseases affecting fall raspberries. Fall raspberries are usually at greater risk of infection than summer raspberries because of the prevailing weather conditions, such as lower temperatures, heavy dews and frequent precipitation. Cool, wet weather is conducive to development of the fungus and infection of the fruit. If the weather remains similar to what it has been, Botrytis will be problematic in raspberries this year.

Symptoms

Typical symptoms include a brown discoloration of the fruit and the presence of a gray fuzzy mold, which can rapidly develop and spread to neighboring healthy berries. Symptoms tend to be more severe inside the canopy and on clusters that are closer to the ground. Even if berries look perfectly healthy at harvest, they can change to a moldy mass within 24 to 48 hours.

Biology of the fungus

Botrytis cinerea is a ubiquitous fungus, which is able to grow and sporulate profusely on dead organic matter. It overwinters in old infected canes and plant debris. The spores are airborne and can travel long distances in the wind. When the spores land on plant surfaces, they germinate and can invade the plant tissues directly or through wounds. Production of spores and infection are favored by prolonged periods of wetness or high humidity and moderate temperatures (60-75ºF). When wet conditions prevail during the bloom period, withering flower parts may become infected by the fungus and lead to latent infections of the young berries. Such infections become active as the berries ripen. Overripe berries and bruised berries are particularly susceptible to infection.

Control

Cultural methods are very important for control of Botrytis gray mold. Choosing a site with good airflow can reduce humidity in the canopy considerably. Low-density plantings/narrow rows and trellising can also reduce a buildup of humidity. Good weed control and moderate use of fertilizer to avoid lush growth are also important. Selecting a resistant cultivar or, at a minimum, avoiding highly susceptible cultivars will help to reduce the need for control measures. During picking, avoid handling infected berries, since spores can be transferred on hands to healthy berries. Timely harvesting and rapid post-harvest cooling can also help to reduce losses to Botrytis gray mold. Several fungicides are labeled for control of Botrytis in raspberries. Fungicide sprays during bloom are important to prevent preharvest infections, while postharvest infections can be reduced by spraying close to harvest. Several efficacious fungicides are available: Elevate (fenhexamid) is a reducedrisk fungicide with locally systemic properties. It has a 0- day PHI and provides good control of pre- and post-harvest gray mold. Switch (cyprodinil and fludioxonil) is a recently registered fungicide with protectant and systemic properties. It has also performed well in raspberry trials in Michigan. Switch has a 0-day PHI. A maximum of four sprays (and two consecutive sprays) is allowed for both

Switch and Elevate. Switch and Elevate are in different chemical classes and may be alternated with each other or with Captan, Rovral, or Nova to reduce the risk of resistance development. (***Source**: Michigan Fruit Crop Advisory Team Alert, Vol. 18, No. 13, July 15, 2003*)

BLUEBERRY

Control of Post-Harvest Fruit Rots in Blueberries

Annemiek Schilder, Michigan State University

Fruit rots in blueberries, such as anthracnose fruit rot (*Colletotrichum acutatum*) and Alternaria fruit rot (*Alternaria* spp.), are generally separated into two types: field rot and post-harvest rot. The former can be seen on berries in the field before harvest and is especially common when berries are left on the bushes too long. So timely harvesting is an important control measure. Post-harvest rot can develop on sound-looking berries, as spores from infected berries can infect them in the field before or during harvest or during processing. Often, these berries look healthy at harvest, but start to rot soon after. Rot may be slowed down by refrigerated storage, but will resume on the supermarket shelves, lowering fruit quality. These infections can also contribute to high microbial counts in frozen berries, leading to rejection of fruit lots by some buyers. Rapid cooling of harvested fruit is important in reducing post-harvest fruit rot incidence, particularly at the later harvests when disease pressure is generally high.

While fruit rot is often not visible until the berries ripen or even after harvest, it is prudent to assume that you will have a fruit rot problem if you had problems in past years. If the first blueberries are starting to show rot, fungicide sprays can still limit new infections of neighboring healthy berries. Applications within one to two weeks of the first harvest can still be beneficial in preventing these late infections. In fact, an additional fungicide application between the first and second harvest may be beneficial under high disease pressure. Examples of fungicides that can be used during fruit development and ripening are discussed below. The strobilurins (Abound, Cabrio, Pristine) are all highly effective against anthracnose with Pristine having the most broad-spectrum activity since it contains two different active ingredients. However, it is also the most expensive of the three. Pristine will also have excellent activity against Phomopsis, while Cabrio has good and Abound fair activity against this disease. All are supposed to have moderate to good activity against Alternaria fruit rot and become quickly rainfast since they are locally systemic. Switch (cyprodinil and fludioxonil) also has some systemic properties and provides simultaneous control of anthracnose, Alternaria, and Botrytis fruit rots. Thus it may be a good choice if several fruit rots are a concern. Captevate (captan and fenhexamid) at the high rate will provide good control of anthracnose as well as Botrytis fruit rot, but this disease tends to be less common in Michigan. Captevate is also fairly expensive. Aliette (fosetyl-Al) is a highly systemic fungicide that provides good control of anthracnose, Alternaria fruit rot, and Phomopsis. Of course Topsin M + Captan can still be used, provided the 7-day PHI of Topsin M is taken into consideration. While Topsin M is a systemic material and is more active against Phomopsis, Captan as a protectant will do much of the work against anthracnose. Therefore, if anthracnose is the disease you wish to control and the weather is relatively dry, a Captan or Captec spray alone may suffice. Do take note of the pre-harvest intervals for the various fungicides. (***Source**: Michigan Fruit Crop Advisory Team Alert, Vol. 21, No. 13, July 11, 2006*)

GRAPE

Warm, Humid Weather is Conducive for Powdery Mildew in Grapes

Annemiek Schilder, Michigan State University

Keep scouting vineyards for powdery mildew as warm, humid weather is conducive to disease development. Don't depend upon a cursory observation of your vines from the seat of your tractor or pick-up truck, but be prepared to "wrestle" with the vine to look at leaves and clusters in dense, shaded portions of the canopy. As a reminder, once powdery mildew gets out of control, it is extremely difficult to arrest the disease. It takes very little diseased fruit (less than five percent) to impart a moldy flavor to the wine. Symptoms of powdery mildew are a white to gray powdery patches on the surface of the leaves and berries.

By now in most areas of the state, the critical period of the highest susceptibility of the fruit clusters to infection should have passed (two to three weeks after bloom). However, there may be late-developing clusters in the canopy that may

still be susceptible to infection. There is also a risk of late (diffuse) fruit infections (e.g., between three and five weeks after bloom) that are barely visible but can compromise the integrity of the berry skin by creating small dead spots, which can provide entry points for pathogens that cause Botrytis and sour bunch rots. Soon, though, we will start focusing mainly protection of the foliage as severe powdery mildew infections can reduce the ability of the vine to produce sugars to ripen the fruit. Most grapevines can withstand some foliar disease, especially late in the season, since they are usually not operating at "full capacity". The susceptibility of the grape cultivar and the crop load are the main factors that determine how much disease the vine can withstand before losses in yield and fruit quality become evident. The weather is also an important factor in this equation.

Unlike other grape pathogens, the fungus does not need free water for infection; moderate to high relative humidity (40-100 percent) is sufficient for germination of conidia. In fact, rainfall is detrimental to survival of conidia as they tend to burst in water. 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.

For infection prevention, good fungicide options include sulfur, sterol inhibitors (Nova, Elite, Procure, Rubigan, Vintage), strobilurins (Pristine, Sovran, Abound, Flint), Endura, and Quintec. Remember that some grape varieties are sensitive to sulfur, Pristine or Flint, and that fungicides differ in their pre-harvest intervals. Also, sulfur applied late in the season may interfere with wine-making so is not advised beyond veraison. Alternating fungicides with different modes of action is important for fungicide resistance development.

If powdery mildew is already present, there are several possible eradicants available: JMS Stylet Oil (paraffinic oil); Armicarb, Kaligreen and MilStop (all potassium bicarbonate salts); and Oxidate (hydrogen peroxide). JMS Stylet Oil (1.5 to 2 percent) appears to offer the best results. Any of the eradicant approaches to powdery mildew require high (at least 100 gallons of water/acre) spray volumes in order to achieve complete tissue coverage as the product needs to come in contact with the powdery mildew hyphae to be effective. One concern with JMS Stylet Oil is that it can delay Brix accumulation, so it is best not to use it after veraison. Also, do not apply oil and sulfur within 14 days of each other. Removing leaves in the fruiting zone for Botrytis bunch rot control can also help reduce powdery mildew severity by increasing airflow, light penetration and fungicide penetration. (***Source**: Michigan Fruit Crop Advisory Team Alert, Vol. 22, No. 13, July 13, 2007*)

General Info:

Small Fruit in High Tunnels at PSU – What Have We Learned?

Kathy Demchak, Penn State University

A few weeks ago, we removed the single-bay high tunnel raspberry and blackberry plants from the first tunnel that we had planted in 2000 because the plants were in decline. What finally was responsible? It appeared to be a viral problem in the end – blistered, crinkled leaves in the spring, vigor going downhill, and crumbly fruit. I didn't submit a sample for a virus test, but I was certain the plants had a virus of some sort. Apparently, the somewhat constant travels of aphids, whiteflies, thrips, bees, and other assorted insects between the raspberries in the woods nearby, and our planting finally resulted in infection. In the tunnels, we were using only biocontrols for insect management (part of a pesticide-free growing attempt), but as we always tell growers, when you're protecting a crop from viruses, the threshold for insect vectors is low, and we apparently exceeded it.

So, what did we learn from it all, besides the fact that we needed to protect the plants from insects? For primocane-bearing raspberries, the yield increase in high tunnels can be tremendous, along with almost no gray mold. If managed only for the fall crop, I'm comfortable saying that a yield increase of at least double the yields from the field can be expected. If also managed with a summer crop, 2.5 – 3 times as much yield is reasonable, though the plants are likely to shift the majority of their yield to the summer unless some significant floricane thinning takes place in the spring. Leaving only two to three floricanes per foot works well. For blackberries, tunnels made the difference between no crop in central PA, and the equivalent of 25,000 lb per acre of marketable fruit on average. Keeping the rows far enough apart – preferably 7' to 8' at least, is important in keeping the foliage dry, and in decreasing disease incidence. We tried them closer together, and pulled that planting out in a little over a year. Some growers tell me that 7' to 8' apart is a minimum spacing and if anything, we should be recommending keeping the rows further apart than that. At this point, we're attributing the yield increases to 2 things: 1) a decrease in stress and photosynthesis shutdown from wind, and 2) adding 3-4 weeks of frost-free growing season onto each end of the season, increases frost-free growing time by 50% in central PA. The plants can do a lot with that.

We grew both raspberries and blackberries similarly to how we did in the field, and it worked pretty well. However, there are a few things I would have changed if I had it to do over again. I would have used a fertilizer balanced in nitrogen and potassium from the start, or maybe slightly higher in potassium as compared to nitrogen, instead of starting out following our usual recommendation of applying only nitrogen after initial fertilizer adjustments because the plants had a higher need for potassium compared to in the field. I think it would have helped to remove the cover from the tunnel at least once every 3-4 years over the winter. This would have helped with leaching of salts from fertilizer, and allowing the soil to freeze over the winter, which would have helped with management of some soil-dwelling insects. We were building up a nice population of ants our raspberry/blackberry tunnel, and had sowbugs and earwigs in our strawberries. The blackberries hosted quite a crop of crown borers – so many that we dug out the blackberries three years ago. This was one way to get rid of the crown borers, but the blackberries came back with a vengeance, though they didn't produce any fruit for a year. This is one instance where a tunnel that has the plastic removed for the winter, like a Haygrove tunnel, would have its advantages. We also had two-spotted spider mites, which I expected to see in high numbers. Management of two-spotted spider mites on brambles was easier than I thought it would be (it was a different story with strawberries), with only two releases of predatory mites needed during life of the planting.

As far as varieties go, from what I could see both in our high tunnels and on growers' farms, I never saw a red raspberry variety that didn't work well in a tunnel, so if you like the characteristics of a particular variety in the field, you'll probably like it in a tunnel. Berry size does increase in tunnels somewhat. It still makes sense to me to grow a cultivar that has a long harvest season, like a primocane-bearer, as long as you have a market for the fruit in the fall.

In strawberries, a plasticulture system in the tunnel worked well. We managed the plants just like we did our field plasticulture field plantings, with a couple of differences. For one, plugs could be planted later – for us, mid-September instead of mid-August. This made the frequent late availability of plug plants less of an issue. The other was that narrower beds of plastic were used (beds were18" wide at the top), and beds were closer together than in the field (4 beds were in a 17'-wide tunnel). With strawberries, management of spider mites was more problematic than with brambles, so we planted the double rows on the plastic closer together (8" apart), and plants within each row further apart, at 18". We planted in the fall, but didn't release predatory mites until the spring after we took the row covers off. Closer scouting during the fall, and possibly any scouting during the winter, might have inspired us to release predatory mites sooner, when we still could have gotten them under control (maybe). A miticide could have been used, as long as the label didn't restrict the use from protected culture. Strawberries also were the crop where sowbugs and earwigs moved in (never saw THAT before…), but the tunnel had stayed closed over the previous winter, and had numerous other crops in it before the strawberries were planted. After trying an assortment of strawberry cultivars, 'Chandler' was still my favorite. 'Sweet Charlie' didn't work at all, blooming in January. There's a day-neutral that is expected to be released from Jim Ballington's breeding program at NC State in the next year or two, which worked well for us, and I'm looking forward to that one being on the market also. While we saw yield increases as compared to field production (1.25 lb per plant, as opposed to slightly less than 1 lb per plant in the field), they weren't as large as the yield increases we saw with brambles, but as growers point out, you never lose a crop because of rain when you're in a high tunnel. The crop also ripens about three weeks earlier than in field production, giving you the early-season advantage. For frost protection, we'd roll down the sides in late afternoon, and apply either one layer or two of a 1.25 oz/sq. yd. row cover, depending on expected lows. We used supplemental heat one year, but the row cover was a much easier option, so we never used the supplemental heat again.

So, where to from here? Folks have always asked about black raspberries in tunnels, and I always thought the harvest season was too short to make it worth growing them in a tunnel. But, we're giving them a try, comparing the performance of 'Jewel' to a primocane-bearing black raspberry from Pete Tallman, a private breeder, in Colorado. I'll let you know how it goes. (***Source**: The Vegetable & Small Fruit Gazette, July 2007*)

Weed Management in Berry Fields with Cultural Practices

Elsa Sanchez, Penn State University

Good cultural practices can reduce many weed problems. All options should be carefully evaluated for suitability on your farm prior to using them. **Site Selection** Good site selection is an important weed management strategy. Select a site with minimal weeds and manage the weeds on the site prior to planting. It is especially important to manage difficult perennial weeds before planting your small fruit crop.

Green manure crops are good options for weed suppression. Select green manures that establish quickly and have large above ground canopies, such as sudangrass or hairy vetch. For more information on selecting a green manure crop see Chapter 2 of the Mid-Atlantic Berry Guide

(http://pubs.cas.psu.edu/FreePubs/pdfs/agrs97.pdf). Site selection also influences the health of the planting. Vigorous plants can out compete many weeds. **Mechanical Management** Timely cultivation can be used to manage most weeds; through there are a few cautionary notes. It is important to identify the weeds in an area before using tillage. In one trial, repeated tillage was very effective for managing Canada thistle, while in minimally tilled plots, Canada thistle became dominant. However, in some instances, a weed problem can be made worse by being spread by tillage equipment as is the case with yellow nutsedge. Another factor to consider before using cultivation is the location of crop roots. Avoid damaging shallowly-rooted crop roots with cultivation; strawberry and blueberry roots are especially shallow. Also, take into account that tillage generally has a negative effect on soil health for several reasons, including decreasing the organic matter content of the soil. Repeated mowing is another cultural tool for managing weeds. Mowing works by decreasing the competitive ability of weeds and also can prevent weeds from producing seeds when timed correctly. Mowing should take place before weeds set seed, or else much of the benefit of mowing will have been lost. **Manage Weeds during Critical Times** Mechanical means for managing weeds are often more effective when weeds are small. This is also a good stage for managing weeds because they do not have the chance to become established.

Critical times during the growing season for managing weeds in matted-row strawberries have been studied. As you may have guessed, a key time for weed management is in the first few months during plant establishment. When weeds were not managed for longer than one month following planting, yield and runner production were lower than when plots were kept weed-free during the same time. When weeds were not managed late in the growing season (September) there was little effect on yield and the number of runners compared to when plots were kept weed-free during the same time. While this indicates that early-season weed management is most critical when establishing a new planting, key times of the year for weed management may vary depending on the weed species typically encountered and on soil moisture levels. In the study predominant weeds included yellow nutsedge, common groundsel, purslane and numerous grass species. If, for example, common chickweed was predominant, it"s possible that late-season weed management may have been equally as important as early-season weed management. In no case should weeds be allowed to go to seed. Many weeds can produce thousands of seeds per plant that will survive in the soil for many years. Also, suppress perennial weeds, regardless of the time of year, to prevent them from establishing. **Mulches** Mulches can also be effective for managing weeds. In one study, commercially available Planter"s paper was found to be effective for suppressing weeds during the establishment year of matted-row strawberries compared to not using mulch. The plastic used in for plasticulture strawberry production can be effective for managing weeds within the strawberry row. Be aware that some transparent plastics are not effective for managing weeds without the use of fumigant prior to laying the plastic. In a trial using a semi-transparent blue plastic, weeds grew so well that they levitated the plastic resulting in the strawberry plants being swallowed underneath the plastic. Fabric weed barriers also are a good option for suppressing weeds and are used by a number of blueberry, black raspberry and blackberry growers. Plastic mulches could be used similarly. Consider other options for red and purple raspberries because of their spreading nature. Another option is placing straw in the alleyways of strawberries in the spring in order to offer some weed control. Straw is also commonly used in bramble planting during the establishment year to manage weeds. Straw should be removed from these planting after the first year because it can promote moisture around the roots which in turn can promote root rots. Applying four to six inches of an organic mulch (for example, rotted saw dust) at the base of the plants is a common practice in blueberry production. In addition to regulating fluctuating soil moisture, the mulch suppresses weeds. **Alleyway Management**

The alleys between rows of plants are well suited to the use of a living mulch for managing weeds. A living mulch is created when a plant is broadcast seeded in the alleyways. When selecting what species to use as a living mulch, choose a plant that will out compete weeds, but will not creep or spread into the row of small fruit plants. Some grass species, such as hard fescue, meet these criteria and have been used successfully as living mulches in bramble and blueberry production. For more information on types of grass and seeding rates Chapter 5 of the Mid-Atlantic Berry Guide (http://pubs.cas.psu.edu/FreePubs/pdfs/agrs97.pdf). Sudangrass, tall fescue or marigolds were direct seeded during renovation to test their suitability as living mulches for matted-row strawberry production. Researchers found sudangrass to be the best of the three living mulch species because it rapidly established, was relatively drought tolerant and had a low fertility need. A disadvantage to the sudangrass was that it grew taller than the strawberry plants. However, to contend with this problem, it was mowed as it exceeded the height of the strawberry plants. Another drawback to using sudangrass was that a high level of strawberry clippers was observed compared to the other treatments. (***Source****: The Vegetable & Small Fruit Gazette, July 2007*)

Upcoming Meetings:

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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