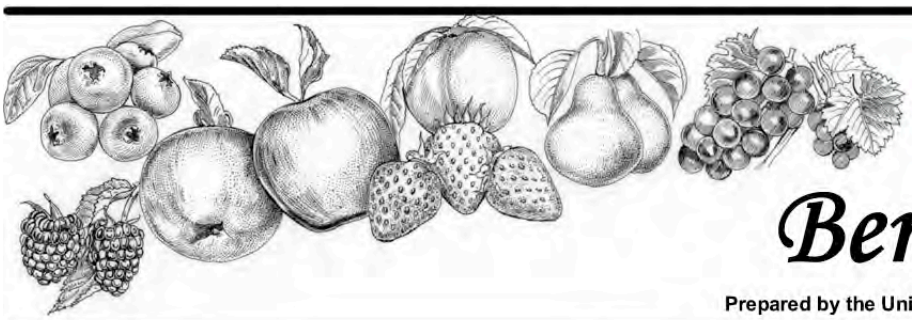

UMass Amherst EXTENSION

Berry Notes

Prepared by the University of Massachusetts Fruit Team

July 1, 2006 Vol. 18, No. 10

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

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IN THIS ISSUE:

Crop Conditions

Strawberry renovation continues. Keep renovated fields as well as new plantings regularly irrigated. Fertilization and irrigation are important for good canopy regrowth. Watch for cyclamen mite infestations. See more below. 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. **Grape** clusters are sizing up. Scouting for disease and insect levels and taking corrective action are important activities before bunch closure. More on this below. 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 two-week period, June 29, 2006 through July 12, 2006. Soil temperature and phenological indicators were observed on July 12, 2006. Accumulated GDDs represent the heating units above a 50° F baseline temperature collected via our instruments since the beginning of the current growing season. 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	2006 GROWING DEGREE DAYS		Soil Temp (°F at 4" depth)	Precipitation (2-Week Gain)
	2-Week Gain	Total accumulation for 2006		
Cape Cod	314	1,076	75˚F	1.25"
Southeast	299	1,070	78˚F	1.26"
East	331	1,159	77˚F	1.25"
Central	317	1,056	65˚F	0.68"
Pioneer Valley	301	1,118	70˚F	1.66"
Berkshires	288	1,008	71˚F	1.23"
AVERAGE	308	1,081	73˚F	1.22"

n/a = information not available

(***Source**: UMass Extension 2006 Landscape Message #19, July 14, 2006*)

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 species, sizes and colour variations. All have the same shape, snout, and hard shell.*

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.

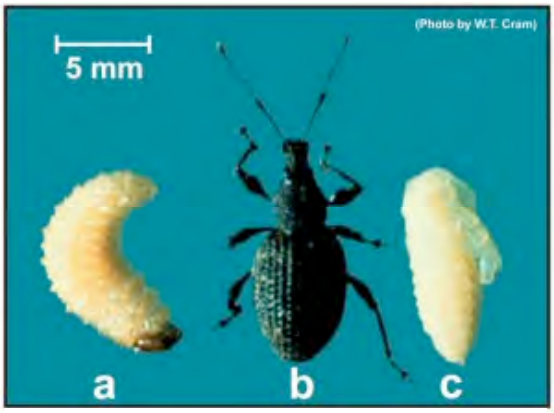

Figure 1*: Life stages of black vine weevil: a - larvae; b - adult; c - pupa*

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*)

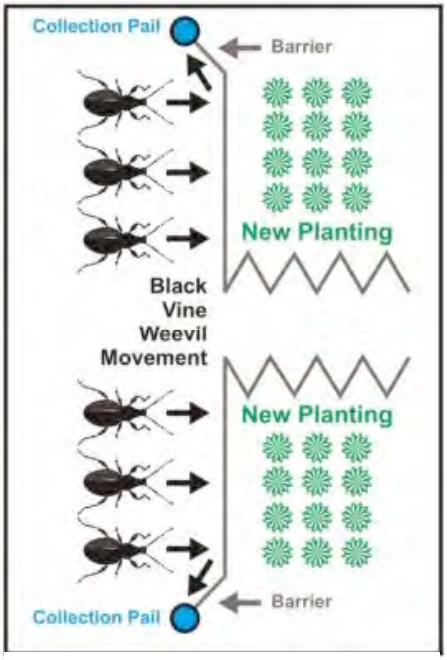

***Figure 5**: Suggested placement of exclusion barrier to manage adult black vine weevil immigrating into new strawberry planting.*

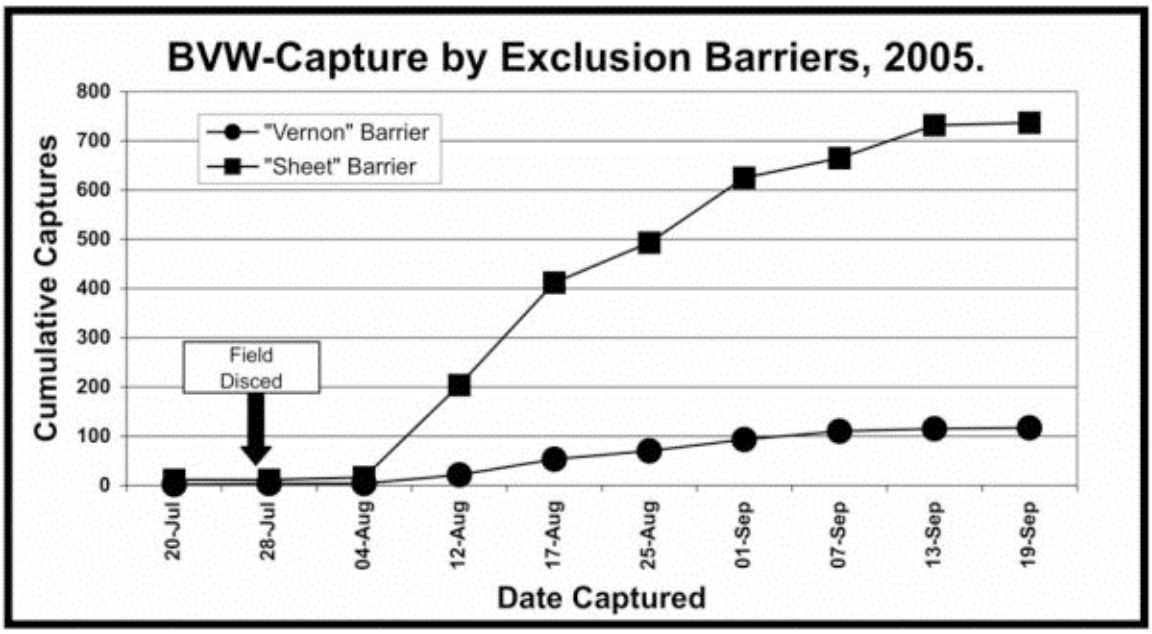

***Figure 4**: Cumulative capture of immigrating, adult black vine weevils by exclusion barriers, Campbellville, ON 2005.*

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*)

Water Management in Blueberries

Gary Pavlis, Rutgers University

Blueberries have shallow root systems that cannot use water stored deep in the soil. As a result, blueberries grow best where the soil has a high water-holding capacity. Information about soil water-holding capacity is generally available in soil surveys. Soil texture is another clue to water-holding capacity (Table 1). In general, sandy soils hold the least amount of water. These soils must be irrigated more frequently and with less water per application than soils with a high percentage of silt and clay.

Crop rooting depth and the soil water-holding capacity are used together to determine the total water-holding capacity of the rooting volume. The capacity of the rooting volume is important in scheduling irrigation.

Table 1. Typical water-holding capacity for various soils.

Texture	Water-holding Capacity (inches of water per inch of soil)
Sand	0.05
Fine Sand	0.08
Sandy loam	0.11
Loam	0.16
Silt loam	0.18
Clay loam	0.19
Silty clay	0.20
Clay	0.22

The following example shows how to determine the water-holding capacity of the rooting volume and how to use this information to schedule irrigations. In this example, assume that blueberries are planted on a sandy loam soil. Using a rooting depth of 1.5 feet, the total water-holding capacity of the rooting volume is 18 inches of soil times 0.11 inch of available water per inch of soil depth, which equals 2 inches of total water-holding capacity. The total water available in the rooting volume should not drop below 50% of the total water-holding capacity. This assures easy access to water by the roots and prevents drought stress. Using this limit in the example, the total water available should not fall below 1 inch, which is half of the 2-inch total water-holding capacity. A blueberry plant growing vigorously in summer can evapotranspire more than 0.25 inch per day. With 1 inch of water available in the rooting volume and approximately 0.25 inch being used per day, it takes 4 days for the blueberry plant to use this stored soil water. Since the average time between rains is 5 days, irrigation is highly desirable for this soil and site under peak use conditions. In general, blueberries grown on light soils with low water-holding capacities will benefit from irrigation most years, even in the humid regions. (***Source**: Blueberry Bulletin, Vol. 22, No. 15, July 12, 2006*)

GRAPE

Pièce de Résistance (The Mildews)

Ashley Myers and Anton Baudoin, Virginia Tech.

What do culinary excellence and grape mildews have in common? Little to nothing, but it's an interesting title for an article about resistance. Conveniently, the other definition of "pièce de résistance" is outstanding achievement. Hmm…an outstanding achievement, pathologically speaking? Resistance development! When a pathogen develops the ability to resist a chemical control it is evolutionarily outstanding and makes life more difficult for those trying to suppress the pathogen population. Just as human pathogens become resistant to antibiotics after continuous use of certain drugs, several of our common grape pathogens have the ability to evolve resistance mechanisms.

For years when only protectant fungicides, such as mancozeb and captan, were used, no resistance was observed, presumably because these fungicides affect several biochemical processes of the pathogen and many genetic changes would need to occur for resistance to develop. With the introduction and widespread use of the systemic fungicides, especially benomyl, then later metalaxyl, the sterol-inhibiting, and strobilurin or QoI fungicides, strains of fungi resistant to one or more of these fungicides began to appear. Resistant strains most commonly develop when single-site or site-specific chemicals are used extensively for their control. Single-site fungicides (often referred to as systemic fungicides because most single-site fungicides are locally systemic) are specific in their site of action, only affecting one or two steps of genetically controlled events in fungal metabolism. As a result, resistant populations can quickly arise, requiring only a single mutation followed by selection of resistant individuals in a population.

In 1997, the first strobilurin was registered for grapes in the United States as azoxystrobin (trade name: Abound). Azoxystrobin was highly effective against downy mildew, powdery mildew, and black rot, with the added benefit of a short PHI (pre-harvest interval). The strobilurin class of fungicides (QoI fungicides) inhibit mitochondrial respiration by blocking electron flow through the electron transport chain by binding to the Qo-site (hence the name, QoI or Qo-site Inhibitor) of the cytochrome bc1 complex. To simplify, strobilurins block one vital metabolic component of the pathogen's cell, and if that one component changes, even slightly, the fungicide no longer works. As a result, the potential of resistance development to the strobilurins is high and methods to minimize resistance appeared on product labels. These include limiting the number of applications per season and guidelines for rotation to non-related chemistries. One group of rotational partners is the SI (sterol-inhibiting) fungicides.

The SI fungicides are site-specific inhibitors of cell membrane formation. Used often since the early 1980s for control of grapevine diseases such as powdery mildew and black rot, shifts towards insensitivity and practical resistance to the SIs have occurred in some vineyards. Higher application rates of the SIs will often still provide powdery mildew control, and there appear to be no well-documented cases of SI resistance in black rot. Bayleton, however, is reputed to have lost much of its efficacy against powdery mildew in some vineyards in the eastern United States. Other SI fungicides are myclobutanil (Nova), tebuconazole (Elite), fenarimol (Rubigan) and triflumizole (Procure).

In 2000, grape downy mildew strains resistant to strobilurins became a problem in several viticultural areas of Europe; currently resistance is well-documented in Italy, Switzerland, Austria, and France. Additional fungi exhibiting resistance to the strobilurins are powdery mildew of wheat and barley, cucumber powdery and downy mildew, gummy stem blight, and leaf spot in turf (USA).

In July 2005, Virginia Tech's Dr. Anton Baudoin began a small resistance survey of **downy mildew** isolates after a vineyard on the Eastern Shore had an unexplained increase in downy mildew, and poor control with pyraclostrobin (trade name: Pristine) and azoxystrobin at labeled rates. The 2005 survey, funded by the Virginia Wine Board, revealed that in addition to the Eastern Shore site, two vineyards in central Virginia and two in western North Carolina, had populations of downy mildew that were resistant to pyraclostrobin and azoxystrobin. Strobilurin resistance of grape downy mildew had not been previously reported in North America but had been present for several years in Europe. Because resistance was detected in three widely separated locations, we should assume that downy mildew resistance to the strobilurins may be more widespread. This would include the strobilurin products Abound, Sovran and Flint, as well as Pristine. Pristine is a binary product that contains the strobilurin, pyraclostrobin, and the unrelated fungicide boscalid (trade name: Endura). For all intents and purposes, only the pyraclostrobin component of Pristine is active against downy mildew. The boscalid is formulated with pyraclostrobin to delay powdery mildew resistance development, but would not be expected to significantly affect downy mildew resistance development.

What is the situation with **powdery mildew**? Because powdery mildew resistance to the strobilurins has been observed in New York and Pennsylvania since 2002, powdery mildew resistance in Virginia would come as no surprise. Indeed, powdery mildew isolates collected in the fall of 2005 from one northern Virginia, one Southside Virginia, and two central Virginia vineyards tested resistant to azoxystrobin and pyraclostrobin. One resistant isolate from each of these vineyards was sent to Switzerland for testing by Syngenta (Abound's manufacturer) and the G143A mutation was found in three of the four isolates tested. G143A was also found in several of the downy mildew isolates, and is a mutation that confers high levels of resistance to the strobilurins. Dr. Baudoin is currently conducting tests for sterol-inhibitor (SI) fungicide resistance on the same group of isolates, with some isolates showing willingness to grow on leaves treated with 3 ppm myclobutanil (trade name: Nova) and comparable concentrations of triadimefon (trade name: Bayleton). Although more tests are needed, these preliminary assays indicate that some erosion of powdery mildew's sensitivity to sterol-inhibiting fungicides is very probable in Virginia.

Let's review the situation, as it can be confusing: The limited resistance testing conducted in Virginia in 2005 provided evidence that *both downy mildew and powdery mildew* isolates have evolved resistance to *strobilurin fungicides*, and that at least *some powdery mildew* isolates have increased *resistance to sterol-inhibiting fungicides*.

To prepare for the upcoming growing season, you should have a plan of action for a powdery or downy mildew resistance scenario. For those who have carefully followed resistance management recommendations, continuing to do so may extend the life of strobilurins as well as the sterol-inhibitor (SI) fungicides. We will call this scenario one. If in the past you have relied heavily on strobilurins or SIs (15 or more applications of a strobilurin fungicide), you should anticipate resistance. We will call this scenario two. It's a good idea to examine both scenarios as the points made in each are not exclusive of one another.

In scenario one, resistance management will be continued. The most critical component of the spray program (this applies to all spray programs) is canopy management. Reducing humidity and improving air circulation and direct sunlight exposure is very important for powdery mildew control, as powdery mildew requires warm, humid conditions for spore germination and development, and is favored by the reduced irradiance within a dense canopy. Good canopy management will also improve spray coverage. Thorough coverage is critical, and poor canopy architecture is often the major cause of disease control failure. Use at least 75 gallons of water per acre and place spray cards in the canopy to monitor coverage. Use full rates of product. This is very important with the SI and strobilurins; using lower rates is analogous to only using half of a prescribed antibiotic. Keep the spray interval narrow (no more than 14 days). Include sulfur at 2 lb/acre where permissible as a tank mix. Use a higher rate (6 - 8 lb/acre) of sulfur in sprays where sulfur is the only powdery mildew product. Alternate chemistries; do not rely on an SI or strobilurin for season-long management.

Where resistance occurs or is suspected (scenario two), it is important to maintain sulfur in your program, using it as a rotational partner or including it with synthetics at the lower rate (2 lb/acre). Quinoxyfen (trade name: Quintec) and Pristine have shown good control of powdery mildew, and may be used as rotational partners with sulfur (or with sulfur-sensitive varieties). Quintec is a fungicide for powdery mildew control only. It has no post-infection activity and therefore should only be used as a protectant. As described above, Pristine is composed of two chemical components, a strobilurin (pyraclostrobin) component and an anilide (boscalid) component. However, if resistance has developed the pyraclostrobin is providing zero control and the boscalid is doing all the work. Both quinoxyfen and boscalid are also at some risk for powdery mildew resistance development; therefore, to keep additional resistance from developing, add sulfur to your Pristine application at the tank mix rate of 2 lb/acre. You may be asking why use Pristine at all? It also has activity against black rot, phomopsis, botrytis, and downy mildew. But wait,

isn't there a downy mildew resistance issue with pyraclostrobin and the other strobilurins? Yes, and boscalid has no activity against downy mildew. Therefore, incorporate a downy mildew protectant fungicide as needed into your sprays, and be sure to scout* for the occurrence of downy mildew. Be prepared to use a non-strobilurin downy mildew eradicating fungicide if an infection period has occurred or young lesions are visible. Horticultural oils also provide good foliar protection against powdery mildew but not as much protection on waxy fruit, due to difficulty in achieving good coverage. Additionally, horticultural oils have no activity against downy mildew. If using horticultural oils for powdery mildew control, be sure to get good coverage (100 gallons/acre) and consider label warnings of 10 days between oil and sulfur applications.

There are a few members of the "rescue squad" should you find your vineyard in a resistance situation with a full-blown powdery mildew infection. They include horticultural oils, sulfur (5 lb/acre), Oxidate, and Armicarb or Kaligreen. These materials must be in direct contact with the pathogen and are especially useful for eradication of berry infection. For berry infection, eradication sprays should be made, via back-pack sprayer or nozzle adjustment, directly into the fruiting zone. It is important to use maximum rates, achieve good coverage, and follow all label instructions for application.

For our 2006 spray schedule at the Winchester research station, we will be following scenario two's guidelines. The backbone of our spray schedule will be mancozeb or captan and sulfur (6 - 7 lbs/acre), relying heavily on sulfur for powdery mildew control except when temperatures exceed 95°F. It is a good idea to test sulfur toxicity with your varieties and weather conditions, especially if you have not often used sulfur in the past. Quinoxyfen (trade name: Quintec, maximum of 3 applications per year) at 3 - 4 fl oz/acre will be rotated with sulfur for powdery mildew control. One or two applications of Pristine (maximum of 2 applications/year) tank mixed with 2 lb/acre of sulfur will be made around bloom. We will reserve horticultural oils or Oxidate or Kaligreen for powdery mildew outbreaks. We will also potentially use one or two sprays of Ridomil MZ (metalaxyl and mancozeb), weather-depending, and phosphorous acid for downy mildew control.

Powdery mildew is one of the most destructive diseases of grapevines. Essentially all hybrid and vinifera wine grape varieties grown in Virginia are either moderately or highly susceptible. Chardonnay is perhaps the most susceptible of the commonly grown varieties and should be regularly monitored* for control failure. Once powdery mildew is present in a vineyard, it is difficult to bring under control. Severe epidemics can seriously affect grape and wine quality, as well as yields, and reduce vine growth and winter hardiness. The most devastating consequence is complete loss of fruit due to heavy powdery mildew fruit infection. The resistance issues of this growing season promise to be challenging to grape growers, especially if weather conditions are favorable for powdery mildew development. Please be prepared - have a plan and stay informed of the information and chemicals available.

Throughout the season, please be sure to check my homepage (http://faculty.vaes.vt.edu/ashley08) for information on Virginia's grape diseases, as well as fungicide resources tailored specifically to Virginia growers. Information on fungicides and spray timing is available in the 2006 VT Pest Management Guide (http://www.ext.vt.edu/pubs/pmg/hf3.pdf). Additional options for treating existing powdery mildew infections can be found in a previous Viticulture Notes article at http://www.ext.vt.edu/news/periodicals/viticulture/05julyaugust/05july.html#II.

* Scouting or monitoring means looking for pest, pathogens, or symptoms in the vineyard at critical times in their development and recording their incidence. Scouting is not riding through the vineyard in your tractor, gator, or golf cart. To effectively scout, you must look inside the vine canopy at the interior leaves and fruit i.e. areas prone to prolonged moisture or wetness. For powdery mildew, closely check leaves and shoots near the cordon and trunk where the cleistothecia (overwintering spores) on the older wood would easily splash onto green shoots and cause infection. Additional tips are to scout with the sun behind you, check borders and interior areas of the vineyard separately, include areas adjacent to woods, monitor at least 100 vines per vineyard, look in hot spots with a history of problems, and inspect both sides of the vine. (***Source**: Virginia Viticulture Notes, Vol. 21 No. 3, May-June 2006*)

Post Infection Treatment of Powdery Mildew

Alice Wise, Cornell University

If forced to treat post-infection, intervene as soon as possible and make sure coverage is good. Clean out infected clusters prior to spraying and leaf pull if time allows. It is unrealistic to expect any material to clean up a raging infection. In addition to a post-infection material, remember that forward protection is also necessary to protect clean fruit. There are several options to clean up powdery mildew infection including JMS Stylet Oil; Nutrol (monopotassium phosphate); potassium bicarbonate products like Kaligreen and Armicarb 100; and Oxidate

(hydrogen peroxide). Organic options are organic formulations JMS and Oxidate.

• **Stylet Oil**: Note the products listed, only Stylet Oil provides any forward protection, albeit limited. The best information available indicates that Stylet Oil provides post infection control as well as at least 4 days of forward protection. Thorough coverage is absolutely necessary. Direct spray at the fruit zone with lots of water. Experience dictates that Stylet Oil works if it makes contact with the infected berries. If the clusters are packed in, if leaf pulling hasn't been done, spray coverage will be compromised and PM will persist. If choosing Stylet Oil, read the label thoroughly as it is incompatible with a number of key materials including sulfur. Note that JMS Stylet Oil has both a standard and an organic formulation. They differ in the inert ingredients. Also be aware of warnings about application in hot weather (phyto risk).

• **Oxidate**: If sulfur has been a regular part of the schedule and the proper interval has not passed, Oxidate is the better option. The Oxidate label calls for consecutive sprays at 128 fl. oz per 100 gallons. Time may be a factor - getting the leaf pulling done and getting consecutive cluster sprays on is time prohibitive for some growers.

There have been several questions on tank mixing Oxidate. Biosafesystems feels that tank mixing Oxidate with either DF or a liquid sulfur should be no problem. To be sure, you might do a jar test first as per the Oxidate label.

• According to Wilcox, Nutrol, Kaligreen and Armicarb function in the same topical, eradicative, "salt on a slug" mode. Again, these do not provide forward protection and they work best when PM infection is in the very early stages. They would not be the materials of choice for an established infection – look to Stylet Oil or Oxidate first. We've heard several times that Kaligreen is widely used in CA though CA does not have the PM pressure that we do here in the east.

Bottom line - all of these materials will not clean up and sanitize infected fruit. They will only kill the PM colonies thus halting the spread of infection to clean fruit. Regardless of strategy, it is probably wise to check fruit closely (look at cluster backsides, clusters jammed up against posts, etc.) shortly after treatment and retreat at the proper interval if PM infection persists. (***Source**: Long Island Fruit & Vegetable Update, No. 18, July 14, 2006*)

General

Lyme Disease Diagnostics

UMass Extension, in cooperation with researchers at UMass Amherst, will assess deer ticks for the presence of Lyme Disease. There is a fee of $35 per sample.

To submit a sample, follow the directions at the UMass Extension tick diagnostics website at http://www.umass.edu/agland/diagnostics/lyme_disease.htm (or Google: UMass Extension Tick).

After submission, results will be reported within 10 business days. BE ADVISED: If someone has been infected by a tick bite, symptoms may begin to occur even before the results of tick testing are available. People should not to wait for tick testing results before seeking medical advice should any symptoms develop.

For specific information, contact:

Dr. Craig Hollingsworth, (413) 545-1055,

chollingsworth@umext.umass.edu

Upcoming Meetings

July 18, 20 6. University of Maine - Highmoor Farm Field Day. Monmouth, ME. For more info, contact David Handley at (207) 933-2100.

July 20, 2006. Fruit & Vegetable Twilight Meeting, Perkins Farm, Plymouth, NH. For more info, contact Tom Buob at (603)787-6944. PAT credits**.**

July 25, 2006. Grower to Grower Meeting, Four Corners Farm, South Newbury VT. This meeting, hosted by Haygrove Tunnels, will emphasize strawberries and raspberries. For directions, contact 866-HAYGROVE.

July 27th, 6:00 PM - Second Annual Celebration of Women in Agriculture - Cheryl Rogowski, owner of W. Rogowski Farm in Pine Island, NY and MacArthur Foundation Genius Award recipient will speak. Dinner provided. Location: Whatley Town Hall. Please reserve your space by calling CISA at 413-665-7100 or emailing coordinator Therese Fitzsimmons at therese@buylocalfood.com. Registration preferred by July 24.

Aug 9, 2006. Tree Fruit Twilight Meeting, UNH Woodman Horticultural Research Farm, Durham, NH. Topics will include assessing damage for crop insurance claims and cultural practices to reduce risks. For more info, contact George Hamilton at (603)641-6060.

Aug. 10-13, 2006. NOFA Summer Conference. Amherst, MA. To see detailed program information or to register online, visit www.nofa.org or contact Deb Pouech at nofasc@herbsnhoney.com or 860-684-0551.

Aug. 14, 2006, 5:30 pm Farm Pond Construction – A Twilight Meeting in Northfield, MA. Eugene and Nathan L'Etoile of Four Star Farms have recently completed constructing two of three ponds for largemouth bass and baitfish aquaculture. They will discuss their project at a twilight meeting at their farm on Monday, August 14 at 5:30 pm. Also presenting information will be Michael Marcus, senior scientist at New England Environmental, an expert on pond construction, and Keith Wilda, aquaculturist at Australis Aquaculture. Discussion will include permit requirements, site selection and pond construction techniques. Information on predator protection will also be provided. For directions Go to: http://www.umass.edu/aquaculture/ and click on *News and Events.* For Information, contact Craig Hollingsworth at 413 545-1055 or chollingsworth@umext.umass.edu.

August 22-23, 2006 North American Strawberry Growers Association Summer Tour, Portland Maine. For more information including a full itinerary, visit www.nasga.org.

August 24, 2006 Bramble Field Day, 3pm – 7pm at Nourse Farms, Whately MA. Enhance your knowledge of bramble diseases and their management through an interactive field day at Nourse Farms. Co-sponsored by UMass Extension and PennState University, this workshop will provide an opportunity to learn about practical methods for identifying common field and postharvest bramble diseases through formal and informal activities. We'll even provide hand lenses that will be yours to keep. We'll discuss sustainable management options including cultural methods and organic fungicides. This meeting will also feature a walking tour of fall raspberry varieties and a review of summer varieties and their performance in 2006. Please pre-register for this meeting by contacting Sonia Schloemann at 413-545-4347 or sgs@umext.umass.edu. There is no fee for this meeting. One contact hour for pesticide recertification credit has been requested. Bring a lawn chair for this meeting. We designed this field day for growers who are intermediate in their knowledge of bramble production. This is a USDA-CSREES/SARE funded event (under SARE grant LNE05-227).

Renewable Energy for Farms and Greenhouses - A Series of Twilight Meetings

Sponsored by The University of Massachusetts Extension Agriculture and Landscape Program, Community Involved in Sustaining Agriculture (CISA) and Donald Campbell Associates

We will be exploring renewable energy systems for farms and greenhouses this summer and fall through a series of twilight meetings. Plan to join us for one or all meetings to learn how alternative energy sources might fit into your business. These meetings will provide information on funding opportunities and feature vendors and experts with a wealth of knowledge and experience. For more information, including opportunities for sponsorship, or to pre-register, contact Tina Smith, Extension Floriculture Program, 413-545-5306, tsmith@umext.umass.edu or Ruth Hazzard, Extension Vegetable Program, 413-545-3696, rhazzard@umext.umass.edu.

Solar Energy
Wednesday, July 26, 2006
4:00 pm – 7:00 pm
Riverland Farm, Sunderland, MA
Host: Scott Reed

Riverland Farm grows 11 acres of organic vegetables and U-pick cut flowers on the banks of the Connecticut River in Sunderland, MA. This past winter, Riverland installed solar panels (photovoltaic modules, also known as PV) as an awning to generate solar electricity to power their coolers and farmstand, as well as to provide a dry, shady area for customers. Other local farmers will be present to discuss their use of PV to power remote water stations, electric fences and drip irrigation.

Additional Speakers:
Mike Kocsmiersky of Kosmo Solar installed the system and will share his expertise.
Bruce Howden, Howden Farm, Sheffield - Howden Farm currently uses a 1.1 kilowatt solar electric system to power drip irrigation for growing fruits and vegetables on their farm

Elizabeth Smith, Caretaker Farm - Caretaker Farm uses stand-alone solar power systems to pump water for their livestock and to supply power for electric fencing.

Don Campbell, Consultant, Donald Campbell Associates - Don will talk about the process of fitting a farm's needs to the types of renewable energy systems currently available including solar hot air systems to supplement heat for greenhouses.

Wind and Solar Energy
Thursday, September 7, 2006
3:00 PM – 6:00 PM
Lion Spring Farm, 236 Dedham, St. Dover, MA
Host: Bob Loebelenz

Lion Spring is a small diversified farm, now engaged in the breeding of Massachusetts Thoroughbred horses. The farm also grows vegetables and herbs for local gourmet restaurants and have a collection of chickens who supply farm fresh eggs for retail sales. On site there is a 4.8 kilowatt photovoltaic system and 3.1 kilowatt wind turbine all feeding a battery bank.

Additional Speakers:

Henry Dupont, Lorax Energy Systems on licensing and choosing turbines

Warren Leon, Renewable Energy Trust on state funded opportunities for renewable energy

Don Campbell, Consultant, Donald Campbell Associates

Don will talk about the process of fitting a farm's needs to the types of renewable energy systems currently available

Field Corn Biomass for Heating Greenhouses
Wednesday, October 4, 2006
3:00 PM – 6:00 PM
Kosinski Farm, Westfield, MA
Host: Mike Kosinski, Kosinski Farm

Kosinski Farm grows 140 acres of blueberries, apples, grain corn, vegetables and tobacco. Five greenhouses provide flower and vegetable plants for retail sales at their farm stand and use in the field. Blueberries, apples and butternut squash are major wholesale crops.

Mike began heating one greenhouse with his own corn three years ago and has been expanding his use of corn for heat each year. This year he is installing two larger stoves with automated auger stoking systems. Field corn fits well into his vegetable rotation. The corn is dried off-site and trucked back to the farm. His production costs are about $60-$65 per ton of corn, which is about one-third of the cost of heating oil ($2.45 per gal.) based on energy costs per BTU.

Additional Speakers:

Rob Rizzo, Mt. Wachusett Community College - Rob uses a variety of renewable energy sources including wood chips, wind and solar power and has reduced the energy costs at the college by 5%.

Bill Llewelyn, Five Point Farm, Northfield - Bill grows and sells corn for energy use. This season he harvested 1,000 tons of corn.

Christine Serrentino, From Field to Table - Christine will talk about the science and economics of burning corn.

Don Campbell, Consultant, Donald Campbell Associates - Don will talk about the process of fitting a farm's needs to the types of renewable energy systems currently available.