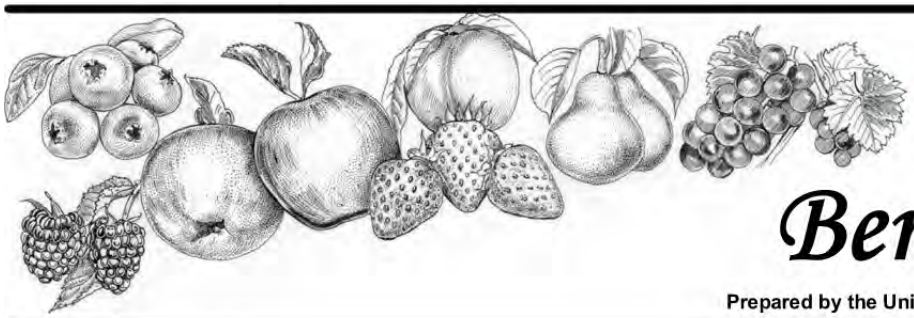


UMassAmherst EXTENSION

Berry Notes

Prepared by the University of Massachusetts Fruit Team

August 2009 Vol. 21, No. 8

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

Berry Notes is edited by Sonia Schloemann with articles written by other contributors with attribution; sources are cited. Publication is funded in part by the UMass Extension Agriculture & Landscape Program, subscription fees and corporate underwriting. Questions can be directed to Sonia Schloemann at 413-545-4347, sgs@umext.umass.edu. Please cite this source if reprinting information that originates here.

IN THIS ISSUE:

Current Conditions:

Strawberry fields remain quiet at this time of year. Dayneutral varieties are still fruiting. Annual production or plasticulture fields will be planted soon. Late summer and early fall is a good time to fertilize both new and established strawberry fields. Leaf tissue analysis can help guide fertilizer amounts but typically strawberries will need 20 – 50 pounds of nitrogen at this time of year. Amounts depend on how much was applied at renovation and the organic matter content of the soil. Check new fields for evidence of potato leafhopper burn and evaluate older fields for the level of foliar diseases. **Highbush Blueberry** harvest is still underway. Wet weather this summer has caused higher levels of fruit rot. See more on this below. Survey fields for weak bushes and determine whether or not Blueberry Stunt or Scorch may be the cause. Only non-nitrogen fertilizer applications should be made this late in the season but leaf tissue analysis is recommended to assess nutrient status and make plans for next year. **Summer raspberry** harvest is done. Be on the lookout for Orange Rust on black raspberries and blackberries. **Fall raspberries** are in full swing. Botrytis fruit rot is still a threat, especially during wet weather. Also check for mites and leafhopper damage. **Grapes** are in veraison (berry coloring). Early table grape varieties (e.g., 'Lakemont', 'Himrod', 'Vanessa', 'Reliance', 'Canadice') may be harvested at the end of the month. Scouting for disease and insect levels and taking corrective action are still important activities now. This year's wet weather has promoted disease development. Scout for symptoms of downy and powdery mildew. Prepare for wine grape harvest by checking fruit ripening parameters regularly. Mite infestations can build up quickly at this time of year. Be sure to check the underside of your leaves.

Good Agricultural Practices (GAPs)

Preventing and controlling the contamination of fresh farm produce is the key to producing wholesome, healthy products. This program helps growers to develop and implement farm food safety plans, and prepares them for GAPs certification. As a result, growers can market their products with greater confidence. Visit http://www.umassextension.org/nutrition/index.php/programs/food-safety/programs/good-agricultural-practices for up to date information on what is happening locally with GAP certification and for training opportunities to prepare for audit and certification requirements.

ENVIRONMENTAL DATA

The following growing-degree-day (GDD) and precipitation data was collected for a two-week period, July 15, 2009 through July 28, 2009. Soil temperature and phenological indicators were observed on July 28, 2009. 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	2009 GROWING DEGREE DAYS			Soil Temp (°F at 4" depth)	Precipitation (2-Week Gain)
	2-Week Gain	*Total accumulation for 2009*	*Total accumulation for 2008*		
Cape Cod	328	1,281	1,677	72˚F	2.85"
Southeast	303	1,276	1,694	76˚F	4.75"
East	--	--	1,730	--˚F	--"
Metro West (Waltham)	277	1,303	1,713	78˚F	2.80"
Metro West (Hopkinton)	--	--	--	--˚F	--"
Central	280	1,244	1,583	65˚F	4.81"
Pioneer Valley	263	1,317	1,652	75˚F	5.97"
Berkshires	279	1,434	1,739	73˚F	3.39”
AVERAGE	288	1,309	1,684	73˚F	4.09"

(***Source**: UMass Extension 2009 Landscape Message #20 July 31, 2009*) *-- = information not available*

STRAWBERRY

Beneficial Nematodes for Black Vine Weevil Control in Strawberry

Vern Grubinger, University of Vermont
(adapted from info supplied by Richard Cowles, CT Agricultural Experiment. Station;
Peter Shearer, Rutgers Cooperative Extension; and others)

The larvae of several kinds of root weevils can cause serious damage to strawberry roots, leading to reduced yield and in at least one case this year in southern Vermont the complete demise of a previously healthy field. Black vine weevil (BVW) is probably more common than strawberry root weevil or rough strawberry root weevil in New England. The life cycle and management of these weevils are the same. Their larvae are whitish, crescent-shaped larvae and 1/4 to1/2 inch long with no legs. Adults emerge and feed from May through August, laying eggs as late as October that hatch and overwinter as larvae. Adult feeding causes characteristic scalloping or notching of the leaf edges, but rarely does this cause economic damage. (Feeding on the interior of the leaf, causing holes, is caused by Asiatic garden beetles or Japanese beetles.)

Adults weevils hide in the crowns during the day and feed at night. They are not easy to kill with insecticides so a better strategy is to kill the larvae with applications of beneficial nematodes. If adults are numerous (i.e. more than 50 out of 100 leaves sampled across the field have notching) then a spray may be warranted. The pyrethroid bifenthrin (Brigade) provides some control if used at the highest labeled rates. The best timing for this spray is at night during the peak feeding activity of adults, before they start laying eggs, or about 1 week before harvest ends. Neem-based products containing azadiractin (such as Aza-Direct) may be acceptable for organic production, and while neem will not kill the adults it can disrupt egg-laying if applied at high rates at least twice. While Admire is very good for controlling some white grubs it is mediocre against Asiatic garden beetle and very poor against BVW.

Although bifenthrin claims to kill spider mites, many twospotted spider mite populations are resistant to pyrethroids. Spraying this product or other pyrethroids usually exacerbates spider mite problems by selectively killing off predatory mites. Growers challenged with black vine weevil problems should plan well ahead, and use horticultural oil (SunSpray UltraFine Oil) early in the growing season. If applied with an airblast mist blower, oil can be inexpensive, effective, and non-toxic to predatory mites. This strategy can then reduce the risk of spider mite problems later. Be sure to use oil about 2 weeks before any Captan sprays, because the two products are extremely phytotoxic. Alternatively, Brigade may be applied with oil 2 to 3 days after mowing the foliage during renovation. This approach should jointly control spider mites and root weevil adults.

The key to successful use of beneficial nematodes is sufficient time for multiplication of the nematodes in hosts (weevil larvae) and dispersal of nematodes throughout the soil. Early- to mid-May application has given excellent results, especially when the numbers of larvae of the next weevil generation are evaluated in the autumn. Research in CT, NJ and elsewhere has shown that the appropriate nematode species properly applied can effectively infect and suppress weevil populations. Heterorhabditis bacteriophora (Hb) appears to be the best candidate for control of root weevils when the soil temperature is above 60 degrees ('J-3 Max Hb' from The Green Spot; 'GrubStake HB' from Integrated Biocontrol Systems; 'Larvanem' from Koppert Biologicals). Beneficial nematodes can also be applied in late summer (August 15 - September 1), and in that case, Steinernema feltiae ('Nemasys' from Griffin Greenhouse Supply, 'Gnat Not' from Integrated Biological Control Systems, 'Entonem' from Koppert Biological) should be considered in northern locations since it tolerates cooler soil temperatures and completes its life cycle so quickly. Other beneficial nematodes may also control weevils but these 2 species were most commonly found established in CT strawberry fields. There is no point in applying beneficial nematodes in early or mid-summer since few larvae are present.

Nematodes are living organisms and they can be killed if they are misapplied. Order nematodes ahead of time and be ready to apply them through a sprayer or irrigation soon after they arrive, refrigerating if delay is necessary. Do not apply nematodes using a sprayer with a piston pump. Use clean equipment, removing all screens finer than 50-mesh. Apply nematodes in early morning or evening in a high volume of water to already moist soil, pre-irrigating if needed. Apply another 1/4 inch of irrigation after application to wash them onto and into the soil. Although references suggest rates of several billion nematodes per acre, I found researchers and suppliers recommended 250 (if banded in the row) to 500 million per acre, at a cost of about $100 to 200 acre depending on volume and source. Green Spot says their formulation requires lower numbers of nematodes but the cost ends up about the same. Ironically, nematodes probably work best in the worst weevil-infested fields. High populations of weevil larvae allow explosive growth in nematode populations, while low populations of larvae may not permit efficient nematode reproduction. Strawberry plants can recover their vigor remarkably well if crown feeding has not occurred and diseases haven't taken over the roots.

Root weevils cannot fly, so they infest new plantings by wandering into fields from surrounding weedy and woodland vegetation, or in large numbers from recently plowed, infested strawberry plantings. Even plantings several hundred feet away can become generally infested as a result of mass migration from plowed fields. A good rotation program with substantial distance between strawberry fields can help to manage root weevils. Also, when turning under old, infested strawberry plantings, it is critical to leave a row or two at the perimeter of the field as a trap crop to protect other plantings. Adult weevils will be intercepted in these rows before they leave the field and thus lay their eggs where the larvae will not do any damage. At the end of the season the trap rows should be turned under prior to planting winter rye. Do not spray the trap rows as this may repel weevils and result in more migration to other fields.

Some Beneficial Nematode Suppliers: The Green Spot: 603-942-8925 or www.shopgreenmethods.com Griffin Greenhouse Supplies: 978-851-4346 or www.griffins.com Integrated Biological Control Systems: 888-793-4227 or www.goodbug-shop.com Koppert Biologicals: 800-928-8827 or www.koppert.com

Mention of pesticides and biological controls is for information purposes only; no endorsement of materials or brands is intended. Always read and follow instructions on the label. (***Source**: University of Vermont Factsheet Series*. http://www.uvm.edu/vtvegandberry/)

RASPBERRY

Botrytis Gray Mold Control in Fall Raspberries

Annemiek Schilder, Michigan State University

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 and heavy rains in the late summer and fall that keep the plants wet for extended periods are conducive to development of the fungus and infection of the fruit. The rainy weather this summer has already resulted in increased Botrytis gray mold pressure in raspberries.

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.

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 on the wind. When the spores land on plant surfaces, they germinate and can invade the plant tissues directly or through wounds. Overripe berries and bruised berries are particularly susceptible to infection. Latent flower infections, even though they do occur, are not as important in raspberries as they are in strawberries.

Cultural methods are very important for control of Botrytis gray mold. Choosing a site with good air flow 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 fertilizer use to avoid lush growth are also important. Selecting a resistant cultivar or, at the 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 pre-harvest infections, while post-harvest infections can be reduced by sprays close to harvest (e.g., the day before harvest). Switch (cyprodinil + fludioxonil) is a reduced-risk fungicide with excellent systemic and protectant activity against gray mold. It has a 0-day pre-harvest interval (PHI). Another good option is Elevate (fenhexamid), which is a reduced-risk, locally systemic fungicide with a 0-day PHI. Since these fungicides are in different chemical classes, they can be alternated for fungicide resistance management. My recommendation is to save Switch and Elevate for critical sprays, e.g., during wet periods and for sprays closer to harvest. Other fungicides that may be used in the spray program are Captevate (captan + fenhexamid) (3-day PHI), Pristine (pyraclostrobin + boscalid) (0-day PHI), Captan (captan) (3-day PHI), Rovral (iprodione) (0-day PHI) and Nova (myclobutanil) (0-day PHI). To improve the efficacy of Rovral, an adjuvant should be added. Pristine and Nova also provide excellent control of late leaf rust, which sometimes infects the leaves and fruit of fall raspberries. (***Source**: Michigan Fruit Crop Advisory Team Alert: Vol. 23, No. 15, August 5, 2008*)

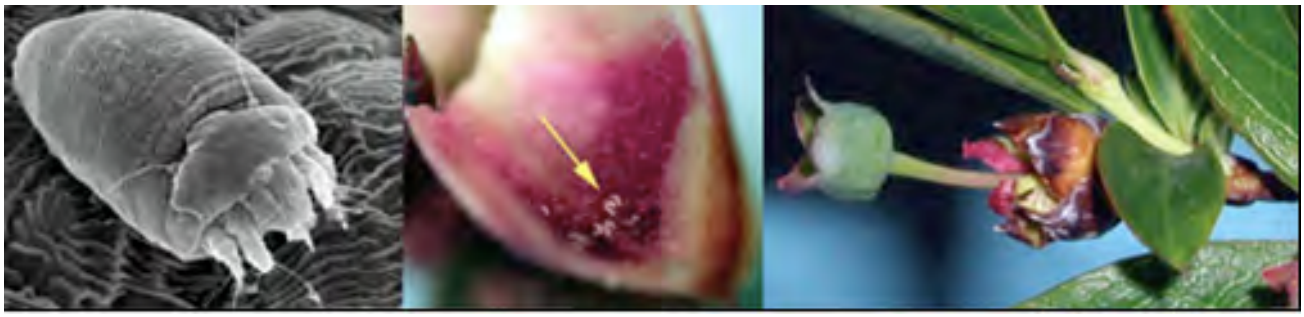
BLUEBERRY

Monitoring and Controlling Blueberry Bud Mite

Rufus Isaacs, Keith Mason and John Wise, Michigan State Univ.

As harvest season comes to an end for some growers in southern counties, it is worth sampling fields that had poor bud development last season to determine whether treatment for bud mites is required in some fields during the immediate post-harvest period.

Blueberry bud mite (*Acalitus vaccinii*) has been identified as the cause of some problems with poor growth and low yield in Michigan blueberry fields. Sampling by crop scouts, MSU Extension, and the Small Fruit Entomology program has detected this pest across most of the major blueberry production regions in our state. However, only some fields have sufficient populations to cause economic levels of injury, and only some cultivars are susceptible. For example, in Grand Junction we have seen Rubel bushes with high infestation and damaged growth growing next to Bluecrop plants that showed no visible symptoms. Because of this, **bud mite management is warranted only in fields where 1) poor growth/damage have been seen, and 2) high bud mite populations have been verified by magnified analysis of bud samples.**



This mite is microscopic (left image), and feeds inside buds in the winter (middle image), causing damage to developing tissues and resulting in symptoms that include blistered red bud scales in spring, misshapen flowers, small leaves and fruit, or few berries per cluster (right image). Berries on infected shoots may also appear roughened and malformed.

The wide variability in symptoms among varieties adds to the difficulty in diagnosing this pest injury. It is important to take shoot samples in the fall as buds are being set or early spring to identify infestations. Bud mites move to

fruit buds formed this year to find places to spend the winter, so fields should be sampled by taking 10 randomly-selected shoots and sampling the top five buds on each shoot for a total of 50 buds per field. These should be examined to verify that bud mites are the problem, because some of the symptoms are quite similar to the catch-all category of "winter damage." This can be done with a hand lens if you know what to look for, or can be done under a microscope by trained personnel. Send samples to your scout, local extension office, crop consultant, or to the MSU Diagnostic Services (www.pestid.msu.edu) for checking. While there has been no research to develop an economic threshold, if 10 percent of the sampled buds are infested with bud mite, and the field is a susceptible variety, chemical control should be considered.

This pest can be challenging to control with pesticides because of its small size and the difficulty of getting miticide residues into the tiny cracks and crevices it inhabits. The immediate post-harvest timing is recommended for targeting this pest because the mites are relatively exposed before the buds have formed completely for the winter. Effective control is extremely difficult once the mites are protected under bud scales, and so prompt action is needed if a planting requires control of bud mites.

Chemical control options for bud mite

Registered miticide options for blueberry bud mite are limited, but include effective products (Table 1). Endosulfan-containing products such as Thiodan 3 EC, Thionex etc. are the most effective miticides for this pest, and these should be applied immediately post-harvest, with reapplication two to three weeks later in heavily infested fields. Although the label recommends waiting six to eight weeks between the sprays, this was developed for southern United States conditions, and in Michigan we do not have that long between the end of harvest and formation of next year's buds. That's why we recommend growers tighten up this period between sprays to get the second Thiodan spray on before complete bud formation. The label recommends that sprays be applied at high pressure (150 to 200 psi) and high gallonage to obtain effective coverage and penetration. Unless the interior spaces of the bud scales are wetted, it is unlikely that good control will be achieved. Use of a surfactant to improve the spreading and penetration of the spray is expected to increase control of bud mites.

Trials of new alternatives to Thiodan including Sulforix have been done at MSU, and we have found that Sulforix provides moderate control of bud mites when applied in the fall. Many growers are using this for a disease control spray at the end of the season and can expect some level of mite suppression if used at this timing, but applications at leaf drop are later than the ideal timing for bud mite control.

An additional option for population suppression of bud mites is the application in spring of a delayed-dormant application of oil. High grade ultrafine oil applied at 0.5-1 percent by volume can help to reduce populations in the spring.

Our pesticide trials at the Trevor Nichols station during 2004-2006 tested options for bud mite control. Table 1 shows the average level of control (compared to untreated bushes) found in these trials for the main registered options for bud mite control.

Table 1. Miticide rates, timings, and efficacy for blueberry bud mite

Compound	Rate / acre	Application Timing	Avg. % control
Thiodan 3 EC, Thionex, etc.	2 qt	Post-harvest	93%
Sulforix	1 gal	Pre- or Post-harvest	60%
Summer oil	1% v/v	Delayed-dormant	27%

Other management options

Pruning infested shoots from bushes is a cultural control that should be done to reduce infestation. In some southern states, bushes are "topped" to cut off bud-mite infested shoots. Many growers leave prunings in the row middles and chop them in the row, but in fields infested with bud mite, the removed wood should be taken out of the field and burned or buried. Chopping this wood in the row middles may spread the mites back onto the bushes.

Biological control agents have been observed feeding on bud mite colonies. These include predatory mites and predatory thrips. While we still know little about the ability of these beneficial insects to control bud mites, it is likely that they are helping to suppress pest mite populations in Michigan blueberry fields. (***Source**: Michigan Fruit Crop Advisory Team Alert, August 11, 2009 -- Vol. 24, No. 15*)

Blueberry Maggot and Late-Harvested Blueberries

Rufus Isaacs and Keith Mason, Michigan State Univ.

Blueberry growers are reminded to continue their blueberry maggot monitoring program for any fields that still have berries to be harvested later this season.

During the first half of this summer, low numbers of blueberry maggot flies were detected during monitoring in southern Michigan fields. Many commercial fields have had weeks with no flies captured, probably due to the dry weather and insecticides applied for other pests. But the recent high rainfalls across southern lower Michigan have made soils highly conducive for maggot flies to emerge. Our scouting this week at blueberry farms (two in Van Buren County and two in Ottawa County) detected flies at three of the four farms; in Covert, Holland and West Olive. This finding emphasizes the need to keep checking traps for blueberry maggot flies and protecting your berries if flies with the correct wing banding pattern are detected. As a reminder of insecticide options, see the article from **July 14** *Fruit CAT Alert* titled "Insecticides for control of blueberry maggot."

For the characteristic wing pattern of blueberry maggot, see this page at the MSU Blueberry website: **http://www.blueberries.msu.edu/bbmaggot.htm**

(***Source**: Michigan Fruit Crop Advisory Team Alert, August 11, 2009 -- Vol. 24, No. 15*)

GRAPE

Grape Ripening

Bruce Bordelon, Purdue Univ.

Grapes have reached veraison and begun the ripening process. (see Fig. 2) Harvest of early varieties will begin soon in the southern part of the state. As harvest nears, it is very important to monitor grape chemistry. Sampling should occur weekly leading up harvest. Fruit quality is comprised of several factors, the most important of which are sugars, acids, and pH. Other factors such as phenolics and anthocyanins, terpenes, and other flavor and aroma compounds can be very important to wine quality as well. And of course, freedom from rots is an important consideration. Unlike some other fruits, grapes do not continue to ripen after harvest. Consequently, it is important to harvest grapes at the peak of quality and with the desired parameters for the intended use.

Figure 2. Marquette at veraison

Wine grape growers should have the ability to monitor sugars (with a refractometer), titratable acidity and pH (with a pH meter and burette). Equipment and supplies to measure these parameters can be purchased for about $500. Each of these factors is important in determining proper harvest time, but none alone can accurately estimate overall fruit quality. It is the balance of sugars, acids and juice pH that is important to the wine maker. And of course, there are the subjective qualities of seed ripeness, skin tannins, aromas, etc. The Berry Sensory Analysis held last September addressed evaluation of these more subjective factors such as skin, pulp and seed maturity.

With wine grapes, all fruit of a given cultivar is usually harvested from the vineyard or block at a single time to coordinate winery activity and to reduce costs. It is important to carefully plan the harvest date to coincide with the optimum fruit quality from the entire vineyard. Most vineyards have some degree of variability in soil type and drainage, sunlight exposure, wind, insect and disease pest, nutritional status, etc. These variations can result in large differences in fruit ripeness. Fruit from adjacent vines as well as from different parts of the same vine can vary.

Differences are caused by variation in crop load (pounds of fruit/vine size), cluster position, degree of sun exposure, vine vigor, and so on. Much of the variability can be reduced with proper vineyard management. A pre-harvest walk through the vineyard block should identify any clusters lagging in ripeness. In most cases, those clusters will never catch up to the rest and will only reduce the overall quality of the crop at harvest. Now is a good time to drop that undesirable fruit. Don't expect your workers to sort as they pick. Go through beforehand and eliminate

the guesswork. (***Source**: Facts for Fancy Fruit: Volume 9 • Issue 6, August 5, 2009*)

Post Verasion Petiole Sampling

Alice Wise, Cornell University

Cornell recommends sampling at this time as one component of a nutrition management program. Individually sample: varieties, problem areas, young vines vs. older vines, dry sandy area vs. area with heavier soil and so on. We use petiole sampling not as the final word but as a complement to soil sampling and vineyard observations when determining our fertilization program. The petiole (leaf stem) of the youngest mature leaf from a bearing primary shoot (e.g. not sterile shoots, not laterals) is sampled. Sometimes hedging makes it a little more difficult. Sampling of a petiole from the top 25% of the shoot should suffice. For varieties with large petioles, take 40 or so petioles. For varieties with smaller petioles, take 60 or more. Further information on Cornell's petiole analysis lab and sampling instructions can be obtained from CCE's Hort Diagnostic Lab, phone 727-4126 mornings, or stop by the Griffing Ave. office during business hours. Check with the lab for current pricing. There are several private labs that also do a good job with tissue analysis. (***Source**: Long Island Fruit & Vegetable Update, No. 23, Aug. 15, 2008*)

GENERAL INFORMATION

Elderberry Pruning: A Research Brief

Cathy Heidenreich, Cornell University,

A recent scientific journal article has been published on pruning American elderberries. The research brief that follows is a summary of the findings presented. For those wishing to read the article in its entirety, a full citation follows the brief that provides author names, article title, and source.

The journal article, written by Thomas, Byers, and Ellersieck (2009), discusses the effect of 4 pruning methods on productivity and characteristics of American elderberry. As noted by the authors, elderberry is increasingly being cultivated in North American for its edible fruit and flowers. It also remains relatively undeveloped as a commercial horticultural crop. Producers establishing elderberry are taking a risk due to the substantial lack of commercial production information for this crop.

Elderberry is rather a unique shrub as it produces fruit on both primary (current season) and secondary (older woody) shoots. Primary shoots arise each spring from spreading underground rhizomes. They end in a single large flower cluster (cyme) that opens a few to several days before those on the secondary shoots. Flower clusters on secondary shoots tend to be smaller and more numerous than those on primary shoots.

The authors hypothesized that the simplest and least costly method of pruning elderberries may be to prune the plants to the ground each spring, perhaps with a motorized or tractor mounted sickle-bar. Well managed plantings pruned in this manner should produce good (although slightly lower) annual yields they projected, than those managed in a more selective annual pruning system. A selective pruning system they thought would be more labor-intensive in terms of both pruning and harvest. Their study was designed to test this hypothesis.

Details of the Study - The researchers examined elderberry flowering, fruit yield, phenology, plant growth, and incidence of disease and arthropods pests in response to 4 pruning methods over a five year period. The pruning methods included in the research trial were: 1) annual removal of all shoots - all shoots cut to the ground in early spring, 2) biannual removal of all shoots – pruning to the ground every other spring, 3) annual selective pruning – removal of all unproductive or poor quality stems and tipping back of strong stems to approx. 3 ft., and 4) no pruning.

The researchers applied these pruning methods to 3 cultivars ('Adams II', 'Bob Gordon', and 'Netzer') at two sites in Missouri. Experimental plots consisted of 3 plants each, planted approximately 4 ft apart in row. Individual plots were separated by 8 ft in row. Between row spacing was 10 ft (total plants/site = 144; approx. 0.25 acres). Treatments were applied and cultivars were assigned to plots in a complete randomized block design with 4 replications for each cultivar x pruning method combination.

Sites were initially prepared by killing existing vegetation with glyphosate prior to planting; at one site shrubs were established on a 20 cm raised soil ridge; on the second site flat, undisturbed ground. Alleyways were seeded with tall fescue that was maintained and mowed at both locations.

Hardwood and softwood cuttings were used to establish plantings. Plantings were fertilized each spring with ammonium nitrate (NH4NO3) at a rate of 50 lb/a N. Plants were provided with approx. 1 to 1.5 inches water/week either by rainfall or drip irrigation. Weeds were managed by mulching, hand-weeding and herbicide application (glyphosate).

The study began after a 2-year establishment period; all flowers were removed during this period to encourage root and structural growth. No other pruning was done during the establishment period. All plants in the study were pruned to the ground in early spring the year the study began.

Plant data collected included fruit yield, cyme number and size, individual berry weight (50 random ripe berries per plot), and plant height. Phenology data included bloom time, fruit ripening, and harvest dates.

Disease and arthropod (insect and mite) incidence data was also collected, using a scale of 1 to 5 where 1 = severe damage and 5 = no occurrence. Eriophid mites (*Eriophidae*) and bacterial leaf spot (*Pseudomonas viridiflava*) were the two pest problems observed and rated.

Study Results - Both plantings survived and performed well during the course of the 5 year study; part of the 'Netzger' fruit crop was lost to birds during first year of the study at one site.

Yield - 'Bob Gordon' yielded nearly 3 times more then 'Adams II' and over 4 times more than 'Netzger'. Annually pruned plants and unpruned plants yielded significantly less than those pruned selectively or biannually. Annually pruned plants consistently produced fewer, larger cymes compared to the other 3 treatments. Berry size was unaffected by pruning method but did vary by cultivar, location, and year. 'Bob Gordon' had the largest mean berry weight. Annual and biannual pruned plants were slightly but significantly shorter than selectively pruned or unpruned plants.

Disease and arthropod pest incidence - Eriophid mites are a very common pest of elderberry; little is known about their taxonomy, life cycle, or management. It has been reported by one researcher that the mites overwinter within and beneath leaf buds in the Czech Republic. This same mite species has been shown to occur on American elderberry in North America. The authors hypothesized annual removal and destruction of stems might remove a significant source of mite buildup. This hypothesis was not substantiated by the results of the study. Mite occurrence was unaffected by pruning but varied by location, cultivar ('Adams II' more affected than the other 2 cultivars), and year. Many eriophid mites are known to be wind-disseminated; the authors speculated re-infestation by mites of annually pruned plots may have occurred either from neighboring unpruned plots or other sources.

The authors indicate it is important to note two other important elderberry insect pests not evaluated during the course of this study might also be managed through annual removal of stems: elder shoot borer (*Achatodes zeae*) which overwinters as eggs on stems, and elder borer beetle (*Desmocerus palliates)*, which overwinters as pupae in the crown and lower stem areas. Because flowers and fruit may be produced reliably with annual removal of stems, this approach to elderberry pest management needs to be studied further.

Pruning method had no effect on bacterial leaf spot as reported in this study. However, the authors suggest the effect of various pruning methods on plant structure and air movement through the canopy still needs investigation in relationship to this disease and various fungal diseases attacking elderberry.

Phenology - Pruning method had a significant effect on phenology. Pruning plants to the ground delayed flowering (anthesis) and fruit ripening by several days. Delay of ripening due to pruning plants to the ground tended to reduce the number of harvests, focusing the harvest window into a narrower time frame. Greater uniformity of flowering, fruiting, and ripening was achieved with pruned-to-the-ground plants because all growth on these plants were primary shoots. This would be of particular importance for the development of mechanical harvest for elderberries.

Some producers may consider the potentially lower overall yield for pruned-to-the-ground plants a fair trade off for greatly simplified pruning and consolidated harvest. Other producers with limited labor/resources for harvest may prefer the annual selective pruning method, allowing for a more prolonger, gradual harvest. Another consideration mentioned by the authors in respect to annual selective pruning and its longer more gradual harvest is the possibility of longer exposure of ripe fruit to the effects of birds, insects, diseases, and weather (i.e. hail).

Other considerations - During the course of their study the authors observed pruning may have an effect on bird predation. Birds tended to prefer fruit born on stiff upright stems (secondary stems). Less woody and rigid primary stems with their large heavy-fruited cymes tended to bend down toward the ground where birds seemed less inclined to attack them.

Final thoughts - The authors indicate while their study provides new information on potential elderberry pruning strategies, questions on the long-term impact of such

methods remain. They identified what seem to be multiple shortterm benefits to annual pruning to the ground. However, they suggest some quantity of stored carbohydrates may be lost when plants are pruned in such a manner. Long-terms effects of annual shoot removal on vigor, productivity, and planting longevity remain to be determined.

To read the original journal article in its entirety see: Thomas, Andre L., Byers, Patrick L., and Ellersieck, Mark R. 2009. Productivity and Characteristics of American Elderberry in Response to Various Pruning Methods. *HortScience* Volume 44 No. 3 June 2009, pages 671-677. (***Source**: New York Berry News, Vol. 8, No. 7*)

Some of My Best Friends are Insects

Art Agnello, Cornell University

There are many insects present in apple orchards that provide a benefit to growers by feeding on pest species. It is important that growers and orchard managers be able to recognize these natural enemies, so that they are not mistaken for pests. The best way to conserve beneficial insects is to spray only when necessary, and to use materials that are less toxic to them. This brief review, taken from IPM Tree-Fruit Fact Sheet No. 18 (available online at: http://www.nysipm.cornell.edu/factsheets/treefruit/pests/ben/ben.asp), covers the major beneficial insects that are likely to be seen in N.Y. orchards, concentrating on the most commonly seen life stages. Factsheet No. 23, "Predatory Mites" (online: http://www.nysipm.cornell.edu/factsheets/treefruit/pests/pm/pm.asp) , reviews mites that are important predators of leaffeeding mites.

CECIDOMYIID LARVAE (*Aphidoletes aphidimyza*)
These gall midge fl ies (Family Cecidomyiidae) are aphid predators, and overwinter as larvae or pupae in a cocoon. Adults emerge from this cocoon, mate, and females lay eggs among aphid colonies. The adults are delicate, resembling mosquitoes, and are not likely to be seen. The eggs are very small (about 0.3 mm or 1/85 in long) and orange. They hatch into small, brightly colored, orange larvae that can be found eating aphids on the leaf surface. These predacious larvae are present from mid-June throughout the summer. There are 3–6 generations per year. In addition to aphids, they also feed on soft-bodied scales and mealybugs.

SYRPHID FLY LARVAE (Family Syrphidae)
The Family Syrphidae contains the "hover flies", so named because of the adults' flying behavior. They are brightly colored with yellow and black stripes, resembling bees. Syrphids overwinter as pupae in the soil. In the spring, the adults emerge, mate, and lay single, long whitish eggs on foliage or bark, from early spring through midsummer, usually among aphid colonies. One female lays several eggs. After hatching, the larvae feed on aphids by piercing their bodies and sucking the fluids, leaving shriveled, blackened aphid cadavers. These predacious larvae are shaped cylindrically and taper toward the head. There are 5–7 generations per year. Syrphid larvae feed on aphids, and may also feed on scales and caterpillars.

LADYBIRD BEETLES (Family Coccinellidae)
• Stethorus punctum: This ladybird beetle is an important predator of European red mite in parts of the northeast, particularly in Pennsylvania, and has been observed intermittently in the Hudson Valley of N.Y., and occasionally in western N.Y. Stethorus overwinters as an adult in the "litter" and ground cover under trees, or in nearby protected places. The adults are rounded, oval, uniformly shiny black, and are about 1.3–1.5 mm (1/16 in) long. Eggs are laid mostly on the undersides of the leaves, near the primary veins, at a density of 1–10 per leaf. They are small and pale white, and about 0.3–0.4 mm (1/85 in) long. Eggs turn black just prior to hatching. The larva is gray to blackish with numerous hairs, but becomes reddish as it matures, starting on the edges and completing the change just prior to pupation. There are 3 generations per year in south-central Pennsylvania, with peak periods of larval activity in mid-May, mid-June and mid-August. The pupa is uniformly black, small and flattened, and is attached to the leaf.

• Other Ladybird Beetles: Ladybird beetles are very efficient predators of aphids, scales and mites. Adults are generally hemisphere-shaped, and brightly colored or black, ranging in size from 0.8 to over 8 mm (0.03–0.3 in). They overwinter in sheltered places and become active in the spring. Eggs are laid on the undersides of leaves, usually near aphid colonies, and are typically yellow, spindle- shaped, and stand on end. Females may lay hundreds of eggs. The larvae have well developed legs and resemble miniature alligators, and are brightly colored, usually black with yellow. The pupal case can often be seen attached to a leaf or branch. There are usually 1–2 generations per year. One notable species that is evident now is *Coccinella septempunctata*, the sevenspotted lady beetle, often referred to as C-7. This insect, which is large and reddish-orange with seven distinct black spots, was intentionally released into N.Y. state beginning in 1977, and has become established as an efficient predator in most parts of the state.

LACEWINGS (Family Chrysopidae)
Adult lacewings are green or brown insects with net-like, delicate wings, long antennae, and prominent eyes. The larvae are narrowly oval with two sickle-shaped mouthparts, which are used to pierce the prey and extract fluids. Often the larvae are covered with "trash", which is

actually the bodies of their prey and other debris. Lacewings overwinter as larvae in cocoons, inside bark cracks or in leaves on the ground. In the spring, adults become active and lay eggs on the trunks and branches. These whitish eggs are laid singly and can be seen connected to the leaf by a long, threadlike "stem". Lacewings feed on aphids, leafhoppers, scales, mites, and eggs of Lepidoptera (butterflies and moths).

TRUE BUGS (Order Hemiptera)
There are many species of "true bugs" (Order Hemiptera) such as tarnished plant bug, that feed on plants, but a number of them are also predators of pest species. The ones most likely to be seen are "assassin bugs" or reduviids (Family Reduviidae), and "damsel bugs" or nabids (Family Nabidae). These types of predators typically have front legs that are efficient at grasping and holding their prey.

PARASITOIDS
Parasitoids are insects that feed on or in the tissue of other insects, consuming all or most of their host and eventually killing it. They are typically small wasps (Order Hymenoptera; e.g., families Ichneumonidae, Braconidae, Chalcididae), or flies (Order Diptera; e.g., family Tachinidae). Although the adult flies or wasps may be seen occasionally in an orchard, it is much more common to observe the eggs, larvae, or pupae in or on the parasitized pest insect. Eggs may be laid directly on a host such as the obliquebanded leafroller, or near the host, such as in the mine of a spotted tentiform leafminer. After the parasitoid consumes the pest, it is not unusual to find the parasitized larvae or eggs of a moth host, or aphids that have been parastized ("mummies"). Exit holes can be seen where the parasitoid adult has emerged from the aphid mummy.

GENERALIST PREDATORS
There is a diversity of other benefi cial species to be found in apple orchards, most of which are rarely seen, but whose feeding habits make them valuable additions to any crop system. The use of more selective pesticides helps to maintain their numbers and contributes to the level of natural control attainable in commercial fruit plantings. Among these beneficials are:

• Spiders (Order Araneida): All spiders are predaceous and feed mainly on insects. The prey is usually killed by the poison injected into it by the spider's bite. Different spiders capture their prey in different ways; crab spiders (Thomisidae and Philodromidae) and jumping spiders (Salticidae) forage for and pounce on their prey— the crab spiders lie in wait for their prey on flowers — and web-building spiders (e.g., Araneidae, Theridiidae, and Dictynidae) capture their prey in nets or webs.

• Ants (Family Formicidae): The feeding habits of ants are rather varied. Some are carnivorous, feeding on other animals or insects (living or dead), some feed on plants, some on fungi, and many feed on sap, nectar, honeydew, and similar substances. Research done in Washington has shown certain species (*Formica* spp.) of ants to be effective predators of pear psylla.

• Earwigs (Family Forficulidae): Although these insects may sometimes attack fruit and vegetable crops, those found in apple orchards are probably more likely to be scavengers that feed on a variety of small insects. (***Source**: Scaffolds Fruit Journal, July 6, 2009 VOLUME 18, No. 16*)

AG in Uncertain Times Webinar Series

Cathy Heidenreich, Cornell University

This is an interactive Extension webinar series designed to assist Ag professionals, including producers, to better understand the changing conditions in today's economy. The series is targeted towards providing information that helps producers make informed decisions and improves Ag professional's ability to work with their farm and ranch customers/clients. Each session is scheduled for 60 to 90 minutes with plenty of opportunity for the participants to interact with the presenters.

September 9, 16, 23, 2009. *Ag in Uncertain Times Webinar Series: Operating in the face of uncertain markets***.**

October 7, 14, 21, 2009. *Ag in Uncertain Times Webinar Series: Families facing uncertainty in agriculture*.

November 4, 11, 18, 2009. *Ag in Uncertain Times Webinar Series: Operating in risky environments*.

December 2, 9, 16, 2009. *Ag in Uncertain Times Webinar Series: Pulling it all together: Managing Ag Enterprises in Uncertain times*.

All webinar start times are at 9AM Pacific. (10AM Mountain, 11 AM Central, and 12 noon Eastern).

For more information: call John Nelson, 509-477-2176, email westrme@wsu.edu, or visit : http://www.farmmanagement.org/aginuncertaintimes/. (***Source**: New York Berry News, Vol. 8, No. 7, July 2009*)

UPCOMING MEETINGS:

Aug. 20, 2009: *New Hampshire Vegetable & Berry Twilight Meeting,* Blueberry Bay Farm, Stratham NH. 5:15-7:30pm. Emphasis will be on pesticide-free growing of mixed vegetables, raspberries, and blueberries. For info, please contact Nada Haddad at nada.haddad@unh.edu or 603-679-5616. Pesticide recertification credits.

Sept. 2, 2009. *Redesigning a Garden Center and Farm Stand for Future Growth.* Volante Farms, Inc., 226 Brookside Rd., Needham, MA**.** 4:30 PM to 7:00 PM. For more information, contact: Tina Smith 413-545-5306 – tsmith@umext.umass.edu, Paul Lopes 508-295-2212 ext. 24 – lopes@umext.umass.edu or Bob Luczai 781-275-4811 - bluczai@ballseed.com. Program details: www.umass.edu/umext/floriculture/upcoming_events/index.html

Sept. 2, 2009: *New Hampshire Vegetable & Berry Twilight Meeting.* UNH Woodman Horticultural Research Farm, Durham NH. 5:30-7:30 pm. Ag Experiment Station Research on Horticultural crops. For info, please contact Becky Grube at becky.grube@unh.edu or 603-862-3203. Pesticide recertification credits.

Sept. 2, 2009 *Soil and Soil Health.* Wellspring Farm CSA, 182 LaFirira Pl, Marshfield VT. 5-7 pm. Sponsored by NOFA-VT. $10 for NOFA members, $15 for non-members. For info, please contact NOFA VT at 80-434-4122 or info@nofavt.org.

Sept. 17, 2009. *Biological Control for Ornamentals in Greenhouses - Putting It All Together.* Tolland County Extension Center, Vernon, Connecticut. 9:30 AM – 3:30 PM. For more information, contact: Tina Smith 413-545-5306 – tsmith@umext.umass.edu. Program details: www.umass.edu/umext/floriculture/upcoming_events/index.html

December 14, 2009. *GAP Training***.** Center of New Hampshire Radisson, Manchester NH. 1:00 pm-5:30 pm. This meeting will introduce the basics of USDA/FDA's GAP (Good Agricultural Practices) Certification Program for wholesale fruit and vegetable growers. For info, contact Shirley Mietlicki-Floyd at 413-545-4420 or mietlicki@umext.umass.edu or Becky Grube at 603-862-3203 or becky.grube@unh.edu.

December 15-17, 2009; *New England Vegetable & Fruit Conference*, Radisson Hotel, Manchester, NH. For more information visit www.newenglandvfc.org.

Massachusetts Berry Notes is a publication of the University of Massachusetts Extension Fruit Program, which provides research based information on integrated management of soils, crops, pests and marketing on Massachusetts Farms. No product endorsements of products mentioned in this newsletter over like products are intended or implied. UMass Extension is an equal opportunity provider and employer, United States Department of Agriculture cooperating. Contact your local Extension office for information on disability accommodations or the UMass Extension Director if you have complaints related to discrimination, 413-545-4800.