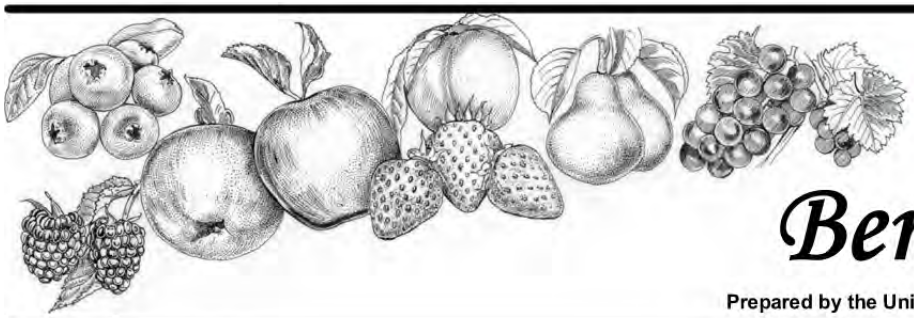

UMass Amherst EXTENSION

Berry Notes

Prepared by the University of Massachusetts Fruit Team

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

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IN THIS ISSUE:

Current Conditions:

Strawberry harvest is complete in many locations. Renovation will be underway soon. See more on this below. Fertilization is important for good canopy regrowth. Watch for root weevil infestations and renovate or plow down promptly if feeding is observed. This will reduce populations significantly. Sprays may still be needed. Also watch for cyclamen mite and potato leafhopper infestations, especially in new fields. Pull blossoms and set runners on new plantings. **Highbush Blueberry** harvest is underway. Fruitset looks very good and good yields are expected. Blueberry Scorch has been found in Massachusetts. Be sure to check for aphids and promptly control aphids in blueberries as they can vector the blueberry scorch virus from infected to healthy plants. See more on this in the last newsletter. 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. Late varieties may still benefit from fungicide applications to control anthracnose and alternaria fruit rots. **Raspberries** harvest is also underway. Primocanes may show flagging from infestation by cane borers. These should be cut out below any sign of tunneling. Watch for twospotted spider mites and potato leafhopper, especially in fall fruiting varieties. Intermittent rain can cause increases in fruitrot during harvest. Be on the lookout for Orange Rust on black raspberries and blackberries. Also keep an eye out for symptoms of fireblight in raspberries. Conditions have been very favorable for Fire Blight in apples this season and this may also be true for raspberries. **Grape** clusters are sizing up. Poor fruitset has been reported in some varieties and may be the result of poor pollination conditions during bloom. See more on this below. Scouting for disease and insect levels and taking corrective action are important activities before bunch closure. Leaf pulling and cluster thinning are helpful to suppress disease potential. Mite infestations can build up quickly at this time of year. Be sure to check the underside of your leaves. Insects that will need attention now are Potato Leafhopper, rose chafer/Japanese beetle and Grape Berry Moth. **Currants and Gooseberries** harvest continues with growers reporting a heavy crop. 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 one-week period, June 17, 2009 through June 23, 2009. Soil temperature and phenological indicators were observed on June 23, 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 (1-Week Gain)
	1-Week Gain	*Total accumulation for 2009*	*Total accumulation for 2008*		
Cape Cod	81	616	704	65˚F	1.60"
Southeast	103	664	--	65˚F	3.10"
East	79	715	773	61˚F	1.84"
Metro West (Waltham)	96	706	706	66˚F	0.65"
Metro West (Hopkinton)	85	788	750	68˚F	1.65"
Central	84	645	688	55˚F	1.73"
Pioneer Valley	96	713	758	63˚F	2.13"
Berkshires	105	769	764	72˚F	3.80"
AVERAGE	91	702	735	64˚F	2.06"

(***Source**: UMass Extension 2009 Landscape Message #17 June 26, 2009*) *-- = information not available*

STRAWBERRY

Strawberry Renovation

Sonia Schloemann and A. Richard Bonanno, UMass Extension

Matted row strawberry plantings benefit from a process called 'renovation' after harvest to stimulate new growth to support next year's crop and to interrupt the build-up of certain pests and diseases mid-way through the growing season. For best results, renovation should be started immediately after the harvest is completed to knock down two-spotted mites, sap beetles and/or root weevils and to promote early runner formation. Early runner-set translates to higher yield potential the following year. Build-up of leaf spots and other foliar pathogens can be cleaned up with this process, too. Renovation should be completed by late-July in normal years. The following steps describe renovation of commercial strawberry fields. Specific rates and timing of applications can be found in the New England Small Fruit Pest Management Guide. To order, contact Sonia Schloemann at sgs@umext.umass.edu or John Howell at howell@umext.umass.edu.

1. **Weed control**: Annual broadleaf weeds can be controlled with the 2,4-D amine formulation (Amine® 4 or Formula 40) applied immediately after final harvest. Be extremely careful to avoid drift when applying 2,4-D. Some strawberry damage is also possible if misapplied. Read and understand the label completely. If grasses are a problem, sethoxydim (Poast) will control annual and some perennial grasses. However, do not tank mix Poast and 2,4-D.

2. **Mow the old leaves off** just above the crowns 5-7 days after herbicide application. Be careful not to damage crown by mowing too low.

3. **Fertilize the planting**. The main goal is to deliver nitrogen at this time to help regrow the canopy. Nitrogen should be applied at 25-60 lbs/acre, depending on vigor and basic soil fertility. Split applications (one now and the rest in 4-6 weeks) are better than a single fertilizer application. This gives plants more time to take up the nutrients in the fertilizer. A leaf tissue analysis (recommended once the canopy has regrown) is the best way to fine-tune your fertilizer program. This will tell you what the plants are actually able to take out of the soil and what nutrients are in sufficient supply or not. See Leaf Tissue Test Sampling Instructions at the UMass Soil and Tissue Testing Lab website at http://www.umass.edu/soiltest/list_of_services.htm for more on this.

4. **Subsoil**: Where tractor and picker traffic has been heavy on wet soils, compaction may be severe. Subsoiling between rows will help break up compacted layers and provide better infiltration of water. Subsoiling may be done as a later step if field conditions are unsuitable.

5. **Narrow rows and cultivate between rows**: Reduce the width of rows to 12-18 inches at the base. More berries are produced along row edges than in row middles. Wider rows lead to lower fruit production (yield and quality) and increased disease pressure. Narrow rows also give better sunlight penetration, air circulation, spray coverage, and over-all fruit quality. Use a roto-tiller, multivator or cultivator to achieve the row-narrowing. Work in the straw between the rows at this time, too. If possible, try to throw 1-inch of soil on top of the rows at this time to stimulate new root formation on established crowns and new runners.

6. **Weed control**: Pre-emergence weed control should begin immediately after the plants are mowed and the soil is tilled to narrow the crop row. The most common practice at this time is to apply half the annual rate of terbacil (Sinbar at 4 oz/acre). It is essential that the strawberry plants are mowed, even if 2,4-D was not applied, to avoid injury from Sinbar. If regrowth of the strawberry plants has started, significant damage may result. Some varieties are more sensitive to Sinbar than others. If unsure, make a test application to a small area before treating the entire planting. Sinbar should not be used on soils with less than 0.5% organic matter or on reportedly sensitive varieties such as Guardian, Darrow, Tribute, Tristar and possibly Honeoye. Injury is usually the result of too high a rate or overlapping of the spray pattern.

If Sinbar is not used, napropamide (Devrinol at 4 lb/acre) or DCPA (Dacthal at 8- 12 lb/acre) should be applied at this time. Dacthal is preferred over Devrinol if the planting is weak. If Sinbar is used, napropamide (Devrinol at 4 lb/acre) should be applied 4 to 6 weeks later. This later application of Devrinol will control most winter annual weeds that begin to germinate in late August or early September. Devrinol should be applied prior to rainfall or it must be irrigated into the soil. During the summer, Poast can be used to control emerged grasses. Cultivation is also common during the summer months. Cultivations should be shallow and timely (weeds should be small) to avoid root damage to the strawberry planting. The growth of strawberry daughter plants will also limit the amount of cultivation possible especially near the crop row.

7. **Irrigate**: Water is needed for both activation of herbicides and for plant growth. Don,t let the plants go into stress. The planting should receive 1 to 1-1/2 inches of water per week from either rain or irrigation.

8. **Cultivate to sweep runners into the row** until plant stand is sufficient. Thereafter, or in any case after September, any runner plant not yet rooted is not likely to produce fruit next year and is essentially a weed and should be removed. Coulter wheels and/or cultivators will help remove these excess plants in the aisles.

9. **Adequate moisture and fertility during August and September** will increase fruit bud formation and improve fruit yield for the coming year. Continue irrigation through this time period and fertilize if necessary. An additional 20- 30 pounds of N per acre is suggested, depending on the vigor.

Overview of the Biology and Management of Root Weevils

Greg Loeb, Cornell University

I have three general goals or objectives I want to accomplish with this article. First, you should come away with a pretty good understanding of how to recognize root weevils that affect berry crops and their damage symptoms. Second, you should have a good sense of the life-cycle of root weevils that impact berry crops and their phenology (when different stages appear in your fields). And third, I hope you will have a general understanding of the different management alternatives.

Biology

Root weevils are beetles in the weevil family (snout beetles). Hence, the adults have elongated snouts and hard or leathery forewings. There are primarily three species of

Figure 2. Photo of larval strawberry root weevil

root weevils, all in the genus *Otiorhynchus*, which attack strawberries in the Northeast (Fig 1). They all look fairly similar, being brown or black in color with small indentations along the leathery outer wings, called elytra, but differ in size. Strawberry root weevil is the smallest at about 0.2 inches in length. Rough strawberry root weevil is a bit larger (0.3 inches) and black vine weevil is the largest (0.4 inches). The larvae all look about the same (Fig 2). They are white or cream colored and legless. The larvae feed on roots while the adults feed above ground on leaves.

The elytra (forewings) of Otiorhynchus root weevils are fused and hence, adults cannot fly. This becomes important for understanding some of the management options discussed below. The adults of the three species pupate in the spring and emerge during late May through June depending on species. Initially the adults feed on leaves, creating characteristic notches along leaf edges. This damage is not of economic importance. This pre-ovipositional stage, where they do not lay eggs, lasts from two weeks (strawberry root weevil) to maybe a month (black vine weevil). If control actions are going to be taken against the adult stage, this is the time to do it, before they start laying eggs. The egg laying period can last much of the summer. Eggs are laid at the base of the plant, hatch, and larvae enter the soil. They initially start feeding on smaller roots but move to larger roots or the base of the crown as they mature. Larvae overwinter in the soil and resume feeding in the spring before pupating (see figure 3 for life-cycle).

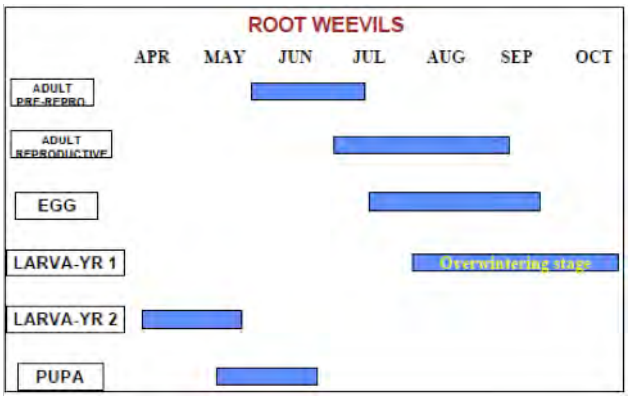


Figure 3. Diagram showing general life-cycle of Otiorhynchus root weevils.

Impact

Feeding damage to the roots causes economic injury resulting in reduced vigor and death, depending on the number of larvae feeding on the root system and the overall health of the plant. Older strawberry fields tend to have larger root weevil populations since it takes time for the fields to be colonized by the flightless adults and for populations to build. The exception would be when an infested field is immediately replanted without insecticide treatment. A heavily infested strawberry field shows weak vegetative growth and patches devoid of strawberry plants (gaps). Sandy sites tend to be more prone to weevil damage but this is probably because these sites also are more prone to drought stress, which is aggravated by the root feeding (Figure 4). There are not good data on how many larvae per plant results in economic damage and it probably depends on the overall health and water status of the planting.

Figure 4. Strawberry planting with serious root weevil damage.

Monitoring

There are several methods for monitoring for adult root weevils in strawberry plantings. The most direct method is to go after dark with a flashlight and inspect for adults on foliage (adults active at night, not day). Perhaps a more practical method is to inspect, on a regular basis from late May through June, for the characteristic notching in leaves caused by adult feeding. You can also put out pit fall traps (plastic cups sunk into the ground with the cup lip even with the ground and partially filled with water plus detergent). A roofing shingle or other structure should be propped up over the trap to shelter it from rain. To monitor for larvae, excavate several strawberry crowns plus 3-4 inches of roots and soil with a trowel. In the spring the larvae are fairly large and easy to see. In summer the larvae are still quite small, but visible.

Management: Host Plant Resistance

There has not been a lot of research on this issue but there appears to be some evidence that different strawberry cultivars vary in their susceptibility to adult feeding. Richard Cowles, Connecticut Agricultural Experiment Station, gave adult black vine weevils a choice between leaves of the cultivar Honeoye and 20+ other cultivars in pair wise choice tests. Five cultivars were less preferred: Delmarvel, Idea, Lester, Primetime, and Seneca.

Latestar, Tristar, and Marmolada were more preferred than Honeoye. The mechanisms for these preference differences are not well studied but the presence and amount of leaf hairs plays some role, as does nitrogen content. Although leaf feeding by adults is not economically important, variation in resistance could still be important for management since adult feeding is directly related to reproduction and larval densities. Cowles also tested for variation among these strawberry cultivars for resistance to larvae but did not find any significant differences. My suspicion is that some cultivars may at least be more tolerant to root feeding than others, although this has not been rigorously investigated.

Management: Cultural Practices

If sufficient land is available, rotating an infested field out of strawberry for a year or two is an effective cultural control method. New plantings should be placed 500 meters away from infested sites to minimize colonization by dispersing adult root weevils. If new plantings need to be located closer to infested sites, there is some evidence, based on research done in Ontario, Canada that a plastic barrier fence can be erected between the new and old planting to reduce rates of colonization of the new planting (see the article by Tolman et al. at [http://www.omafra.gov.on.ca/english/crops/hort/news/allontario/ao0306a2.htm]. A final idea for mitigating root weevil feeding damage on roots is to make sure the planting is well watered and maintained in good health. Of course, over watering can cause other problems related to root diseases.

Management: Biological Control

Although insect predators such as carabid beetles are known to feed on root weevil larvae, the best-developed method of biological control is the use of insect parasitic nematodes. Several studies have been conducted showing that the inundative release of large numbers (2.5 to 3 billion) of infective juvenile insect parasitic nematodes can reduce the density of root weevil larvae and damage. Two species in the genus *Heterorhabditis* have shown promise in our area: *H. bacteriophora* and *H. marelatus*. There are two times during the season that are good for releasing nematodes: spring as soil temperatures raise above 50 F and in the later summer or early fall. It's important for either release times that there is sufficient water via rain or irrigation to ensure the nematodes get moved into the root zone. There are a number of commercial sources for insect parasitic nematodes. See the web site on nematodes maintained by Ohio State University[http://www2.oardc.ohiostate.edu/nematodes/nematode_suppliers.htm]. Integrated Biocontrol Systems (Greendale, IN, [www.goodbug-shop.com]) is one supplier I am aware of that carries both of these *Heterorhabditis* species. IPM laboratories in Locke, NY (315-497-2063) also supplies *Heterorhabditis bacteriophora* as well as other nematode species.

Management: Chemical Control

In the past growers targeted the larval stage for chemical control using the insecticide carbofuran. This was an effective means of control but this insecticide turns out to be quite toxic to waterfowl and has subsequently been banned for most uses. Our current approach, therefore, is to target the adult stage using one of two insecticides: bifenthrin (Brigade WSB) or malathion (e.g. Malathion 57 EC). The idea is to kill the adults during the pre-oviposition period before the females have a chance to lay eggs. The best way to time the application is to scout for adult feeding damage in June. About ten days after the first sign of adult feeding would be appropriate, although the pre-ovipostion period varies depending on species from a couple weeks for strawberry root weevil to maybe a month for black vine weevil. Since the adults are nocturnal, an evening application may be more effective than a daytime application. You may need to make more than one application since adult weevils can emerge over an extended time period. (***Source**: New York Berry News, Vol. 8, No. 5, June 2009*)

Sowbugs and Strawberries

Kathy Demchak, Penn State Univ.

A local grower mentioned he was having trouble with sowbugs eating holes in his strawberries last year. However, the literature says that sowbugs eat dead and decaying organic matter, and that they typically aren't a problem for crops. Have you ever heard of this happening anywhere else? Are there any materials that can be used to help with this problem?

Yes, and yes. We had major problems with sowbugs eating holes in strawberry fruit in our high tunnels. I thought the problems we were having were isolated incidents, but since then, I've heard from a few strawberry growers with sowbug problems, and the

problem has occurred in the field as well as in high tunnels. Maybe the problem wasn't as isolated as I thought.

In every case where sowbugs have been a problem, there has been organic matter involved, either as a mulch, a compost, an unharvested root crop, or wood for permanent raised beds that started to decompose, as in our tunnels. In these situations, the sowbug population starts building on an abundant organic (organic meaning carbon-containing, in this case) source of food, but once the population becomes high and the original food source decomposes further, the sowbugs will eat whatever they can find that is soft enough. Strawberries certainly fit the bill.

One of the growers had tried a product called Sluggo Plus (other trade names exist) that is labeled for control of both snails and sowbugs (and some other soil-dwelling pests), and apparently it worked quite well. Sluggo Plus contains iron phosphate for slug control (same as in the product Sluggo) and spinosad, which affects the sowbugs and other insect pests. One caution is that there is a 3-day PHI for Sluggo Plus, as opposed to Sluggo which can be used up to the day of harvest. So, if you're seeing sowbugs, you'll want to get this product on before harvest begins.

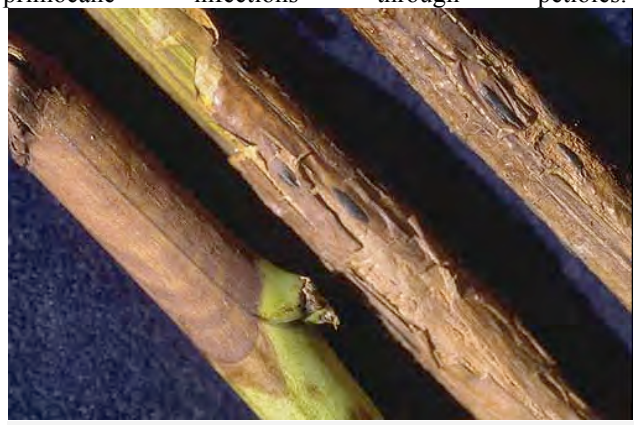
*(**Source**: The Vegetable & Small Fruit Gazette, May 2009, Volume 13, No. 5)*

RASPBERRY

Fruit Rot and Cane Botrytis in Raspberry

Jay W. Pscheidt, Oregon State University

Cause: *Botrytis cinerea*, a fungus that causes blossom blight, preharvest rot, postharvest rot, and cane infections. On raspberry, it overwinters as sclerotia on canes and mycelia in dead leaves and mummified fruit. Sclerotia produce conidia in spring. A moist, humid environment is ideal for pathogen sporulation and spread. All flower parts except sepals are very susceptible. Initial infections of flowers are latent such that the fungus is dormant until fruit ripens. Fruit rot may be more prevalent in wet weather, in fields under overhead set irrigation systems, or where fruit ripens in the field for mechanical harvest. Conidia can infect mature or senescent leaves, resulting in primocane infections through petioles.



Note the concentric shades of brown on these canes and the black sclerotia.

Symptoms: Rotted fruit, usually with tufts of gray fungus growing on surface. Receptacles of picked fruit also may be colonized and become gray with fungus spores. Pale brown lesions may appear on primocane leaves in mid- to late summer. Cane infections appear as tan to brown lesions often encompassing more than one node. Cane lesions exhibit typical concentric "watermark" patterns from fall through late winter. Sclerotia may be visible on canes as shiny, black, blister-like structures.

The fruit rot and a fuzzy, gray mycelial growth develops.

Cultural control:

1. 'Munger', 'Chilliwack', 'Comox', 'Fairview', 'Meeker', and 'Nootka' have shown moderate resistance to Botrytis fruit rot. 'Chilcotin', 'Meeker', 'Nootka', and 'Willamette' have shown resistance to Botrytis cane infections.
2. Create an open plant canopy: use a double top wire training system, prune, avoid excessive nitrogen fertilization, and control weeds. These practices improve air circulation, increase light penetration, and speed drying of plant surfaces after irrigation and rain.

3. Pick fruit in the coolest part of the day. Keep harvested fruit in shade while in the field, then move to cold storage as soon as possible.
4. Control early-season primocanes.
5. Adjust irrigation to early morning just before the sun rises so plants dry quickly. Switch from overhead to drip/trickle irrigation.
6. Remove fall fruit during tying time.

Chemical control: Spray first at 5% bloom and then again 7 to 10 days later. Applications during the growing season, especially pre-harvest, aid control in wet weather. Thorough coverage and canopy penetration are essential.

1. Captan 80 WDG at 2.5 lb/A. Do not apply within 3 days of harvest. 72-hr reentry.
2. CaptEvate 68 WDG at 3.5 lb/A Do not apply more than two (2) consecutive application, within 3 days of harvest or more than 17.5 lb/A/season. 48-hr reentry.
3. Elevate 50 WDG at 1.5 lb/A. Do not use more than 6 lb/A/season. Can be used up to and including the day of harvest. 12-hr reentry.
4. Iprodione-based products plus another fungicide with a different mode of activity. Can apply the day of harvest. Note Fungal pathogens have shown resistance to iprodione when used exclusively. Tank-mix with other registered fungicides and limit to two (2) applications per year. 24-hr reentry.
    a. Iprodione 4L AG at 1 to 2 pint/A.
    b. Nevado 4F at 1 to 2 pint/A.
    c. Rovral 4 Flowable at 1 to 2 pint/A.
5. Pristine at 18.5 to 23 oz/A. Do not use more than 2 consecutive applications or more than 4 times/year. Can be used day of harvest. 12-hr reentry.
6. Switch 62.5 WG at 11 to 14 oz/A. May be used up to and including the day of harvest. Do not apply more than twice sequentially or use more than 56 oz/A/season. 12-hr reentry.

Notes: Other chemical(s) may be available under temporary, emergency use (section 18) or state crisis exemption labels. Double check with your local extension agent or chemical supplier.

Tests in western Washington have shown that the products Messenger and Serenade do not control this disease and are not recommended.

References:

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

Ellis, M. A., Madden, L. V., Wright, S. R., Madden, L. V., and Wilson, L. L. 2008. Efficacy of pre-harvest fungicide applications and cold storage for post-harvest control of botrytis fruit rot (gray mold) on red raspberry. Online. Plant Health Progress doi:10.1094/PHP-2008-1015-01-RS.

(***Source***: *OSU Online Factsheet for Plant Disease Control, Updated Jan. 2009*)

BLUEBERRY

Blueberry Aphid Management

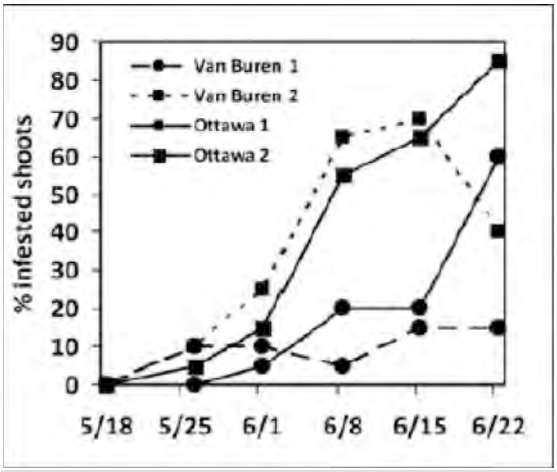
Rufus Isaacs, Michigan State Univ.

Blueberry aphid is the vector for blueberry shoestring virus, which can cause bush decline and significant yield reductions. Because of this, aphids should be managed to minimize the spread of the virus and its transmission to susceptible plantings.

2009 aphid population growth

Aphids hatch from overwintering eggs during early bloom and build their colonies through asexual reproduction. Aphids are limited by nitrogen, so they tend to grow fastest on the new young growth and especially on heavily fertilized bushes.

Populations can grow quickly through May and June. This trend has been seen this spring already, at two of the four fields scouted each week for the Blueberry IPM Project (see graph). Biological control agents such as ladybeetles, lacewings and tiny parasitic wasps can often



Blueberry aphid population growth at four blueberry fields, Spring 2009

prevent or delay population growth, and we have seen much faster growth of aphid colonies on bushes where natural enemies were excluded. Growers should be monitoring fields for aphids and controlling this pest in fields where shoestring symptoms have been detected. The Van Buren 2 field in this graph has applied Provado this spring to control aphids in a Jersey field.

Scouting for aphids

Aphids are most often found on the undersides of young leaves at the base of plants. To scout for aphids, examine two young shoots near the crown on each of 10 bushes in a field and record the number of shoots where aphids are found. Multiply by five to get the percentage of infested shoots. It is also a good idea to record the number of shoots with parasitized aphids to get a measurement of the level of biocontrol present in your field. Be sure to sample weekly from as wide an area in the field as possible to have a better chance of detecting whether aphids are present.

Look on the undersides of leaves, especially at the base of bushes, to find aphid colonies.

Varietal susceptibility to shoestring virus

Some varieties are resistant to shoestring virus. Resistant varieties include Bluecrop and Atlantic. Varieties with moderate resistance include Draper, Aurora, Liberty, Legacy, and Brigitta and aphid control should be considered in these fields, especially if there are symptoms of shoestring virus present. Aphid control is most important in fields containing varieties that are susceptible to the shoestring virus, such as Jersey, Blueray, Burlington, Earliblue, Elliott, Jersey, Rancocas, Rubel, Spartan, and Weymouth. If fields of these varieties contain symptoms of shoestring, aphid control should be a priority during the season and infected bushes showing symptoms should be tagged and removed in the late fall once aphids are not able to be spread through the field during removal.

Aphicides for control of blueberry aphid

There are some excellent aphid control materials available to blueberry growers. These should be applied in June as aphid populations start to increase with application by ground sprayers that ensure coverage of the lower part of the bush. Good coverage is essential for effective aphid control, and this will be more challenging in weedy fields. Controlling the aphids now will limit spread of the virus, thereby reducing the loss of yield or need for removing infected plants.

The most effective insecticides for aphid control are the systemic neonicotinoid insecticides Assail 30SG (2.5-5.3 oz/ac), Provado (4 oz), and Actara (3-4 oz). Foliar applications of these products will move in treated leaves, helping ensure that aphids receive a lethal dose. They also provide long-lasting control; because these insecticides are very effective and blueberry aphids do not readily form winged individuals, getting excellent control early in the season typically provides season-long control. Selection of an insecticide for aphid control may be made considering the other pests present, to get multiple insects controlled with one spray. For example, Assail and Provado are also labeled for blueberry maggot (check the rates), and Assail is also labeled for fruitworms.

Soil-applied neonicotinoids Admire and Platinum can also be used to provide aphid control. These must be banded under the bush and watered in to allow them to get into the plant tissues.

Broad spectrum insecticides applied for control of other pests such as fruitworms can also provide some control of aphids. Lannate and the various pyrethoids registered for blueberry are active on aphids if applied to target the lower shoots. However, these can also be disruptive to natural enemies, so fields should continue to be monitored for aphids to ensure that the populations do not increase again later in the season.

Harvest-time considerations

In mechanically-harvested fields, patterns of virus infection are often along the rows, indicating spread by harvesters. Aphid control prior to harvest is particularly important in fields with a history of shoestring infection to prevent this method of spread. Washing harvesters before moving to the next field is a simple strategy to further reduce the spread of blueberry shoestring virus within and between blueberry farms.

New blueberry aphid/virus publication from MSU

We have produced a new bulletin titled "Blueberry Aphid and Shoestring Virus" which is MSU Extension bulletin E3050. This is available for purchase through the MSU Publications office, and can be downloaded as a printable version for free from this webpage **www.ipm.msu.edu/cat09fruit/E3050.pdf**

(***Source**: Michigan Fruit Crop Advisory Team Alert, June 23, 2009*)

Early Summer Weed Management Options

Eric Hanson, Michigan State Univ.

Many blueberry fields in Southwest Michigan received heavy rains in late April that affected weed control. If fields were treated with preemergent sprays prior to the rains, efficacy may be reduced by runoff and leaching. Growers who did not get their preemergent treatments on before the rains could not get back into the fields until after many weeds had emerged, so control was reduced.

Leaching potential of preemergent herbicides.
Heavy rains can reduce efficacy by leaching herbicides down in the soil, or by carrying the chemical away from the treated area by runoff. Leaching losses are most likely in blueberry fields because soils are often sandy. Runoff losses usually are associated with the movement of soil particles, and is less likely in blueberry fields with little slope. Estimating the leaching potential is not straight forward because it depends on both the solubility as well as how tightly it is adsorption to soil particles. Based on solubility levels and general field observations we would consider Velpar and Sinbar as highly prone to leaching (Table 1). Callisto is also very soluble, but we have limited field observations to draw from for this newer product. Princep, Solicam, Chateau and Casoron are expected to be the lease prone to leaching.

Although these herbicides are unlikely to move out of blueberries fields with surface runoff, they may move within fields and concentrate in lower areas as water recedes. This could result in herbicide injury to bushes in low areas of fields treated with soluble herbicides such as Velpar or Sinbar. Bushes in low areas may also be stressed by prolonged periods of saturated soils as well.

Early summer herbicide options.
Most fields of early season varieties are within a month of harvest so pre-harvest interverals (PHI) limit which herbicides can be used. The PHI's for some blueberry herbicides are well defined on the labels, whereas others are vague (Table 2). We are now too close to harvest to apply preemergent herbicides. However, in fields where preemergent treatments were not applied, or where efficacy is poor due to rain, postemergent products such as Aim, Rely, and Roundup can still be applied, if used with caution. These chemicals will damage any green bark, new shoots, or leaves of blueberries, so minimize contact with bushes. Orient nozzles so they do not contact the base of bushes, or spot-spray by hand taking care to avoid the crown of plants. New canes are now emerging from buds on the crowns of bushes and these can be killed by Aim, Rely, or Roundup. (***Source**: Michigan Blueberry IPM Newsletter, vol 3, No. 9, June 9, 2009*)

Table 1. Solubility and leaching potential of some blueberry herbicides.

Product	Chemical	Solubility (ppm)	Leaching potential
Princep	simazine	2	low
Karmex	diuron	47	medium
Sinbar	terbacil	710	high
Solicam	norflurazon	28	low
Velpar	hexazinone	30,000	high
Chateau	flumioxazin	2	low
Casoron	dichlobenil	21	low
Callisto	mesotrione	15,000	high

Table 2. Preharvest intervals or restrictions for some herbicides on blueberries.

Product	chemical	Pre-harvest restrictions
Pre-emergent herbicides		
Princep	simazine	Do not apply when fruit are present.
Karmex	diuron	Apply before germination of annual weeds.
Sinbar	terbacil	Apply before weeds emerge or in early seedling stage.
Solicam	norflurazon	Do not apply within 60 days of harvest.
Velpar	hexazinone	Apply before bud break.
Chateau	flumioxazin	Apply before bud break.
Casoron	dichlobenil	No clear restrictions stated.
Callisto	mesotrione	Apply before first bloom.
Post-emergent herbicides		
Aim	carfentrazone	Apply up to harvest
Gramoxone	paraquat	Apply before new canes or shoots emerge
Rely	glufosinate	Apply up to 14 days pre-harvest
Roundup	glyphosate	Apply up to 14 days pre-harvest

Where Did All the Grapes Go?

Mark Longstroth, Michigan State Univ.

This year (2001) most of the grapes fell off the vines about one week after bloom. Cool weather before and during grape bloom delayed bloom by about 10 days and then resulted in a ragged bloom. These conditions lead to poor fertilization of the crop. Some of the vineyards have lost almost all their berries, most show reduction to 10 berries or less per cluster very few vineyards show little or no damage. Often these conditions can be seen in different areas of the same vineyard. Some growers are doubtful the remaining crop was worth spraying and harvesting.

Grapes are a warm weather plant and grow best at temperatures above 50F. Juice grapes such as Concord and Niagara were almost in bloom on May 21. Cool, cloudy weather with average temperatures near 50F followed and warm temperatures did not return until June 8. This cool weather virtually stopped the growth of the vines. On May 21, I thought the grapes were ready to bloom. I thought with the cool weather forecast for the week that they would bloom at the end of the week. They looked the same on May 28, a week later; I looked for and saw no bloom. This cool wet weather affected all the crops grown in our area. Corn was stunted in the fields and insect pests were virtually nonexistent as the weather was too cold for insects to be active. Apple growers were unable to apply apple-thinning sprays because it was too cold for these sprays to work.

There was a brief warm period with temperatures in the 60s on May 29-31 when grape bloom began. Bloom was delayed by about 10 days. The delay in bloom by cool conditions probably resulted in some losses but the cool conditions during bloom also resulted in poor pollination. Cool temperatures returned on June 1 with average temperatures at or below 50F. These temperatures again shut down grapevine growth.

The results on the flowers were even more devastating. At temperatures below 60F few flowers open. Some flowers open at the base but the cap does not fall off, so the flower cannot be pollinated. In order to set fruit the flower must be pollinated by several pollen grains. Each pollen grain germinates and forms a pollen tube. This pollen tube then grows down an ovary at the base of the flower and fertilizes one of the ovules inside. There are 2 ovaries in the flower and each ovary has 2 ovules so grapes can have 4 seeds. The fertilized ovule now continues growth as the seed in the fruit. Grape berries with 2 or more seeds are likely to say on the plant and grow. Berries with one or no seeds usually fall off. Grape pollen has an optimum temperature of 65F for grape pollen tube growth, below 60F pollen growth is reduced. The pollen grain has enough energy reserves to live about 24 hours after germination. It is doubtful that the pollen fertilized many berries pollinated before June 8 before it died. On June 8, warm weather returned and bloom was almost finished on June 11. Most of clusters had finished blooming, only a few clusters in the vineyards were still in bloom. I was surprised to see as many fruit as I saw. On June 18, it was obvious that we had lost a lot of berries. The unfertilized berries fell off the clusters as warm weather returned and growth of the fertilized fruit began.

Most of the berries fell off the vines in the week after bloom. I would estimate losses at 60% or more across the entire region. Some of the vineyards have lost almost all their berries, most show reduction to 10 berries per cluster (less than third of normal), and a few vineyards show little damage. Often these conditions can be seen in different areas of the same vineyard. An awful lot of this variation is probably due to the timing of the bloom and the local conditions in the vineyard where some vineyards had warmer temperatures in bloom than other vineyards or were delayed in bloom until the warmer weather came.

Fruit set is extremely variable. On some plants there are only 2 or 3 berries per VINE, while another area in the same vineyard shows a good crop.

Grape growers are now faced with hard questions. Are my grapes worth spraying or can I reduce the amount of sprays to save money? Are they even worth harvesting? I would not recommend any more fertilizer. The vines will be too vegetative already with the light fruit set. Insects that feed on the leaves will not be as important as when we have a full crop, so we can tolerate more damage by Japanese beetle and grape leafhopper. Weed control should probably be reduced since we will want to use the competition from the weeds to slow down the growth of the vines. Grape berry moth control will probably be very important, as there will be fewer berries out there for all the female berry moths to lay their eggs on. So some sprays can be reduced or eliminated and others become more important.

Combing the grape vines will probably be very important this year. Combing means pulling the shoots of the vine so that they grow perpendicular to the trellis rather than along the top of the trellis. Combing will allow better sunlight penetration into the vines. One immediate result will be the increase in carbohydrates into the shoot nodes and buds close to the vines, at the base of the shoot. These buds are the one that we will leave after pruning this winter and will bear next years crop. (***Source**: Michigan State Univ. Extension of Van Buren County Factsheets, 2001*)

Grape Tumid Gallmaker

Erin Lizotte, Michigan State University

Grape tumid gallmaker (GTG) are about 2.5 mm long. They are dark brown to reddish, delicate flies, with feather-like antennae and have only one pair of wings. It can be difficult to positively identify the adults because of the large number of similar midges in North America.

The galls are typically located on leaves and measure between 3.2 to 6.4 mm in diameter. Galls may also form on petioles, and flower clusters. Heavy infestations may reduce vine vigor and can cause shoots to break, but in most instances, galling is of little economic importance. If galling occurs on flower clusters, poorly shaped fruit clusters or the complete loss of clusters can result.

Adults produce one to three generations per year, depending on weather and climate. The life cycle begins with an egg laying in unfolding buds or shoot tips. These eggs produce larvae that then enter the vine tissue. As the larvae begins to feed, a gall forms around them. When the larvae are mature, they leave the gall and drop to the soil, where they pupate. Depending on the time of year, larvae will pupate and become adults, or they will overwinter in the soil and emerge as adults the following spring.

Pesticide applications for GTG are not economically practical unless the infestation is heavy or the vineyard has a history of gall problems. If treatment is required, it should target the adults from the overwintering generation as they emerge. As it is difficult to positively identify adults, it may be easier to time control measures based on the first signs of larval entrance into vine tissues, indicated by small white scars. Growers might also consider burying the pupae by mounding soil up under the vines early in the season. This form of cultural control may prevent adults from emerging.

Reference: L. Clark and T. Dennehy, Department of Entomology, Cornell University.

(***Source**: Michigan Weekly Vineyard IPM Scouting Summary Report for the week of June 23, 2008*)

Beetles On Grapes

Alice Wise and Daniel Gilrein, Cornell University

We have also been seeing Oriental beetle in the research vineyard in recent weeks. According to CCE-SC entomologist Dan Gilrein, it may be feeding lightly but is probably not doing economic damage. A brief overview of beetles from Dan: "There are several notable scarab pests here and some confusion surrounds their identity. Except for turfgrass, ornamentals and a few other situations, control is generally with foliar sprays if needed.

Oriental beetle: emerging from late June onward, they are abundant now. Shaped like Japanese beetle but usually tan with dark grey or black markings, some all tan or black. The beetles often rest on plants but do very little feeding. Some are active during the day but more during the early evening. The grub stage is our #1 turfgrass pest and sometimes damages roots of other plants.

Rose chafer: A slender, pale tan beetle with gangly reddish legs. Emerges starting around late May, but relatively uncommon here on LI. More often a pest upstate and elsewhere.

Japanese beetle: Brown with metallic green thorax, they are starting to emerge now (first ones in late June here). The adults (beetles) can be very destructive to grapes, roses and other ornamentals. The grub stage damages roots of turfgrass and resembles but is less common than oriental beetle.

Asiatic garden beetle: Chestnut-brown, more rounded than Japanese beetle, they are active at night and often seen around porch lights. They appear starting in late June (a similar but different species has been active over the last month). The beetles sometimes feed on foliage of plants such as basil, peppers and ornamentals, hiding in the soil beneath during the day. The grub stage is sometimes a serious pest of turfgrass (esp. parts of CT) and possibly other plants. There was an 'outbreak' of beetles several years ago damaging many garden plants." (***Source**: Long Island Fruit & Vegetable Update, No. 17, JULY 3, 2008*)

GENERAL INFORMATION

Hail Damage: Trying to Make the Best of a Bad Situation

Laura McDermott, Cornell University

Late spring and early summer 2008 has been fraught with hailstorms throughout the state. Hail is sporadic and unpredictable and can devastate an entire region or just a few rows in a specific field. This year, in addition to smaller hail events, a large storm swept through the center part of the state on June 16th and left millions of dollars of damage in its wake. From Niagara County to Columbia County, fruit and vegetable growers suffered massive losses to crops that had withstood repeated frost threats, dry early spring weather and late spring deluges. In light of the expected interest in locally grown produce and what had appeared to be an excellent crop, these losses were particularly devastating.

What is Hail? Hail usually occurs on days that are hot and humid, resulting in strong upward convection of air, creating large thunderclouds. The temperature in the upper levels of these clouds are well below freezing, and water droplets that are carried into the middle and upper layers of the clouds quickly turn into ice balls. The ice ball grows as it falls down through the cloud and then is tossed back up by the convective action of the warm air from earth. Each trip up and down through the cloud allows more water vapor to condense and then freeze on the growing ice ball. The result of this action is easily seen if you cut a hailstone open and observe its "onion-like" layering. The strength of the air currents in the cloud helps determine how large the ice ball will be before it finally gives in to gravity. A single trip through a thundercloud can cause a hailstone to enlarge by 1/2", so several trips are necessary to create large hail. Hailstones usually are less than 1/2" in diameter, but sizes over 1.5" are not uncommon. (1)

What does hail damage look like? Hail damage can appear as bruising and/or pitting on fruit, leaves that are tattered or shredded, complete defoliation of the plant and stem pitting. In fruit that is close to maturity, these wounds can look very similar to bird damage. Stem pitting can cause problems for bud formation and thus have an impact on the following year's crop. Hail damage is easy to tell immediately after a hail event, but as callous tissue develops over the wounds it may become more challenging to recognize. Pay attention to the pattern of damage, both on the plant itself and within the field and larger area. Look for bruises or wounds on one side of the damaged plant or plant part. Evidence of hail damage on

woody plants will persist for years – these wound sites may show secondary infection problems later on. (2)

What are the effects of hail damage? Depending upon the severity of the storm, the obvious effects are the complete loss of the crop and perhaps the death of the plant. Immediate loss of fruit is extremely disappointing, but the secondary damage is the real problem as wounds caused by hail can serve as the infection sites for fungi and bacteria.

How can I minimize the effects of hail damage? Due to the unpredictable nature of hail, it's hard to recommend not planting in "hail prone" areas, but that is mentioned in the literature. For those with berry crops in the ground, there are a few strategies to employ that might help reduce current or future damage.

• Salvage the ripe fruit as quickly as possible. Get rid of ruined fruit - it becomes a real mess, and is a HUGE sugar source for fungal diseases. If you can clean up the fields within a few days of the hail event, you have a decent chance of salvaging the remaining crop. Green berries will often heal well enough to have very minor appearance problems and might still be satisfactory for U-Pick.

• According to Dr. Kerik Cox, Cornell University Fruit Pathologist, growers must consider the type of damage, the fruit, and the primary disease threat at the time the hail event to decide which fungicide to spray. Fungicide use helps reduce the growth of opportunistic fungi that take advantage of the wounded tissue to colonize the berry.

For instance, if the hail damage was to blueberries and it removed all fruit and caused severe stem pitting, the grower would remove fruit as best she could, then spray to help prevent canker diseases on the blueberry shoots.

Try to use materials that will provide a broad spectrum of defense and give you some ongoing protection. For example, rather than use Elevate, which does a great job on Botrytis, the grower should consider a strobilurin fungicide which would give a longer period of protection from a greater number of pathogens. **Apply this spray as soon after the damage as possible, ideally within 24 hours of the event**.

• If you are an organic grower, even a spray of Stylet oil might help with diseases like leaf rust and powdery mildew.

Keep an eye out for diseases that should be removed by hand, like fireblight on raspberries or even Botrytis on ripe fruit. Prune out injured tissue where possible.

• Don't be too quick to throw in the towel. Plants look especially poor immediately after the damage, but in a few days they will look much better. Baby the plants for a while. Keep them well watered, control weeds, prune and destroy damaged canes on woody plants. Make sure mulch is in place in proper amounts.

• Explore the use of hail netting which might also solve existing bird problems. I don't know anyone that has hail netting on berries, but if you start pricing this material, you should also be considering growing your crop in a high tunnel

• According to Marie Ulrich, CCE Orange county Vegetable Extension Specialist, "Growers need to TAKE PICTURES of damage ASAP and report even the tiniest amount of damage to FSA and/or crop insurance adjustor. Accurate, timely damage assessments can only be taken now, even while waiting for them to "grow out of it" production loss might be down and growers will need paper back-up for insurance and or NAP payments."

References:

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2. **Schubert, T. 1991.** Hail Damage to plants, Plant Pathology Circular No. 347, Fla. Dept. Agric. & Consumer Serv., Division of Plant Industry.

(***Source**: New York Berry News, Vol. 7, No. 5, July 2008*)

Controlling Japanese Beetles in Fruit Crops

Rufus Isaacs and John Wise, Michigan State University

Japanese beetles have only one generation per year, but these beetles emerge over a long period from late June through August and can live for over 30 days. They feed on the foliage and fruit of various fruit crops grown in Michigan, causing damage to the plant and increasing the risk of fungal diseases. Their emergence during mid-summer can also result in their presence during harvest of some fruit crops, creating a risk of contamination. They are also highly mobile insects and can fly into fields from surrounding areas. This article provides information on insecticide options based on tests over the past few years conducted at the **Trevor Nichols Research Complex** and at grower's farms.

A few thoughts about trapping…

Traps are sold widely for Japanese beetle monitoring and control. However, these insects are very easy to see so they can be monitored by looking on the crop – you will know when they are present from the feeding damage and the beetles. Traps are highly attractive and draw beetles to them over large distances, so putting a trap anywhere near your crop fields will draw beetles from the surrounding landscape. Many of the attracted female beetles do not get trapped and end up laying eggs in the soil near the trap, so

this creates a hot-spot for next season. Mass trapping of beetles is also not economically feasible in commercial fruit plantings, and there is little evidence that this strategy will work to reduce beetle populations and crop injury. The take-home message is that traps should be avoided because they will not help reduce Japanese beetle damage in fruit crops.

Broad-spectrum insecticide options for control

The carbamates Sevin and Lannate provide immediate kill of beetles present during the application. They are also stomach poisons, so if beetles eat treated foliage they will also receive a higher dose. This can be a good property for control of Japanese beetles since they eat so much that a strong dose of insecticide is taken up. Lannate has a short residual activity of a few days, whereas Sevin provides a week or more of protection. Sevin has a three or seven day PHI depending on the crop, and Lannate ranges from three to 14 days. The organophosphates Guthion and Imidan (buffer Imidan to pH 6.0) both provide excellent lethal activity on adult beetles, although it can take a few days for their effects on Japanese beetles to be seen as the beetles take up the insecticide. They provide 10 to 14 days of activity, with three to 21 day PHI, depending on the crop. The pyrethroids Danitol, Asana, Brigade, Baythroid, Mustang Max, and Capture give instant knockdown and mortality of adult beetles with seven to 10 days of activity. Beetles that do not receive a lethal dose of pyrethroid may also be repelled from treated fields, providing an additional mode for reducing infestation of crops. Use of pyrethroids in tree fruits may also result in mite flaring because of toxicity to mite predators. PHI's for pyrethroid insecticides vary from one to 14 days and can be different in different crops, so check the label before use or consult the table at the back of the 2009 edition of the *MSU Fruit Management Guide* to compare PHI's.

Reduced-risk insecticides

The labeling of the neonicotinoids Provado, Actara, Assail, Venom, and Clutch for use in some fruit crops provides selective options for Japanese beetle management. These insecticides provide two to five days of lethal activity from contact with surface residues before being absorbed into the foliage. Thereafter, beetles must eat treated foliage to get a dose of the insecticide. Once inside the foliage, these locally-systemic insecticides are relatively rainfast and provide anti-feedant and knockdown activity, but with much less direct mortality. These neonicotinoids will also provide some control of aphids and leafhoppers. The rate of these insecticides allowed in different crops will have a large impact on their effectiveness, and growers should consider the higher end of the rate range to achieve some lasting control of Japanese beetles. Most labels will provide guidance on the rate that is appropriate for control of this pest. Avaunt is now labeled for use in grapes, with Japanese beetle, grape berry moth and leafhoppers (suppression only) on the label. Trials underway this season will determine its performance in Michigan vineyards.

Pre-mixed insecticides such as Voliam Flexi and Leverage contain one or more active ingredient that is active on Japanese beetles. In the case of Voliam flexi, thiamethoxam is the same active ingredient (AI) as in Actara. In the case of Leverage both AI's, imidaclorpid and cyfluthrin, have activity on Japanese beetle. It is prudent to examine the rates of each active ingredient in these pre-mixes to determine whether a pre-mix is right for your needs.

Short PHI and organic options

For growers looking for beetle control immediately before harvest or in organically grown fruit crops, some selective insecticides with zero day PHI's can provide a tool to repel beetles and help achieve beetle-free fruit during harvest. Compounds containing neem (Azadirect, Ecozin, Neemix etc.) have a zero day PHI and pyrethrum (Pyganic) has a 12-hour PHI. These compounds are labeled for organic use, and have a short but effective impact on adult Japanese beetles with some mortality, some knockdown off the crop, and some repellent activity. Typically there is only one to two days of activity against beetles because the residues do not remain active for long. The non-organic form of Pyganic, called Evergreen, also has a 12-hour PHI, and is much more effective against Japanese beetle than Pyganic due to the addition of a chemical that inhibits the beetle's ability to break down the insecticide.

A final option for protection against Japanese beetle is SURROUND WP, a white clay material applied to create a white coating on the surface of foliage and fruit to provide protection against insects. When applied to provide a good coating (typically requiring two or more applications), SURROUND has performed very well against Japanese beetle in trials conducted in blueberry and grape. If considering this approach to Japanese beetle control, be aware that the white coating on the fruit may require some removal after harvest to make the fruit marketable. This may be challenging for some types of fruit. For example, in blueberries the white residue was removed well from the surface during processing, but deposits in the calyx cup were not completely removed even after running berries through a typical wet processing line with food grade detergents.

Soil-applied insecticides

Japanese beetles typically lay their eggs in moist grassy areas and many fruit farms have a large amount of this highly suitable habitat. An additional approach to reducing the impact of Japanese beetles in a farm is to reduce the overall population by targeting the grub stage of this pest to reduce the abundance of beetles in the following year. If the location of high grub densities near fruit fields is known, these areas could be treated with a soil insecticide to get maximum return on this treatment. Our experience in Michigan blueberry fields has been that

application of Admire (16 oz/acre) to grassy field perimeters in late June or early July reduced the abundance of beetles on bushes for the first few weeks of their flight period in the next growing season. After that, beetles flying into the area from outside overwhelmed this effect, so there is only a short-lived benefit from targeting the grubs in fields surrounded by infested grassy areas. However, as part of an overall integrated pest management (IPM) program to minimize the impact of Japanese beetle, this approach can help reduce the number of beetles growers must control. Platinum is another soil-applied insecticide that can be used for this grub control strategy. (***Source**: Michigan Fruit Crop Advisory Team Alert, June 30,2009*)

New Nematode Product Registered by EPA

Pasteuria Bioscience news release

Pasteuria Bioscience has received registration from the EPA for *Pasteuria usgae*. This is a critical step toward the commercial use of *Pasteuria spp.*, a natural bacteria prevalent in soil that have long been recognized as promising biological control agents for plant-parasitic nematodes, the company said.

"It confirms *Pasteuria* usgae as a safe, effective and an environmentally-friendly agent for sting nematode control," said David Duncan, Ph.D., chief executive officer for Pasteuria Bioscience

Pasteuria spp. was first discovered more than 50 years ago and identified as an effective agent for nematode control. Scientists have considered *Pasteuria* to be among the most promising biological agents for control of plant-parasitic nematodes, but until recently, no one was able to grow *Pasteuria* outside of the body of a nematode. Thus, it could not be produced cost-effectively on a commercial scale. Pasteuria Bioscience has developed a revolutionary new technology that allows the rapid and cost-effective growth of multiple strains of *Pasteuria* manufactured through traditional fermentation methods.

The Society of Nematology and other organizations estimate global crop losses due to nematodes at $100 billion annually making it agriculture's largest unmet pest control need. With current nematicides being voluntarily removed from the market due to safety and environmental concerns, few nematicide options exist to meet this demand. The registration of *Pasteuria spp.* is important in offering environmentally safe, cost-effective and reliable nematode control products helping to fill the niches that will be vacated by current nematicides.

With a pipeline of product candidates based on *Pasteuria* technology, this registration is the first of many to come. *P. usgae* is a biological nematicide and will be targeted for control of sting nematode in the golf, sports turf and landscape markets.

"This first step is important for Pasteuria Bioscience and serves as validation of the credibility of *Pasteuria*-derived products," Duncan said. "We're confident about the future of this technology as an important tool to help growers control nematodes in a variety of crops and regions of world." (***Source**: Ag Professional Weekly, Vol. 9, No. 24, June 16, 2009*)

New Growing Degree Days Calculator Offered

The Weather Channel news release

In a partnership between Monsanto Company and The Weather Channel Interactive, the two have launched the Growing Degree Days calculator on The Weather Channel's Web site www.weather.com/farming.

The Web site section, launched in January, has been a success with the agricultural community. As growers began using the site, they also offered feedback about future designs, including the addition of a growing degree day calculator. The Weather Channel Interactive and Monsanto have worked together to create the online tool available to compute growing degree days (GDD), a measurement that relates to anticipated crop growth by calculating the amount of accumulated heat over a specific period of time. Farmers enter location, select a base temperature and choose start and end dates to get their GDD result.

"The growth and development of crops is directly impacted by the growing degree days, and having this information available can help farmers make better informed management decisions," said Boyd Carey, lead of technology development for Monsanto. "TWCi has created an easy way for growers to run those calculations to compare different years at a given location. In a spring like this one where we've had so much rain and so many cloudy days across our agricultural production areas, this tool could prove useful immediately."

Farmers can compare two different years' GDD (as far back as 2003) for the same date range and location. Additionally, each calculation — one of the most complex on weather.com — includes the 30-year-average GDD for the selected dates and location, alerting farmers to the typical GDD for the selected time frame and location. The calculator uses both forecast and 30-year climatology data from The Weather Channel, allowing for past, present or future calculations. The calculator draws from the most accurate weather data available, using proprietary TruPoint technology created by The Weather

Channel. TruPoint forecasts allow for future weather information accurate up to 2 kilometers (1.24 miles). This technology combines traditional weather observations with even more data to create forecasts for more than 1.9 million locations — literally filling in the gaps of the reporting systems used by other providers. (***Source**: Ag Professional Weekly, Vol. 9, No. 24, June 16, 2009*)

The Hidden Cost of Damaged Nozzles

Jason St. Deveau, OMAFRA

Many factors contribute to a successful spray application: sprayer mechanics, application method, weather conditions, nature of the target, product applied and the aptitude of the operator. All of these factors converge when the spray leaves the nozzle. It is therefore surprising that the most critical part of the sprayer, the nozzles, are so often neglected. Monitoring nozzle performance pays financial dividends because tip damage has a direct impact on product effectiveness and cost (see Table 1). If the application is seriously compromised, the operator might have to re-spray, which incurs additional labour, time, fuel, and wear-and-tear on equipment.

The Potential Impact of Damaged Nozzles

Nozzle Damage	Result	Possible Causes	Potential Impact
Worn Nozzle	Over Application	Regular Use (particularly with wettable powders)	• Higher Product Cost • Phytotoxicity (particularly on heat or moisture stressed plants) • Unacceptable Residue level
Plugged Orifice	Under Application	Debris Dirty Carrier Water Product Build-up	• Inadequate Protection • Increased Risk of Resistance
Distorted Orifice	Uneven Application	Regular Use Improper Cleaning	• All of the Above

The solution lies in proper maintenance and early detection. Tip orifices have delicate edges, so clean them with a soft-bristled brush or using a can of compressed air. Even a wooden toothpick can distort some plastics, so imagine what a wire does. Better still, carry spares for quick field replacements and clean them later in the workshop where they won't get lost. Be sure to clean nozzle screens with a brush as well because flushing does not dislodge build-up. Nozzle performance should be tested during each calibration (before and mid-way through the season at minimum) or whenever damage is suspected. Testing is simple, quick and inexpensive:

Temporarily install a pressure gauge on the boom behind the nozzle (commercial or home-made);

Adjust the regulator to compensate for the pressure change between the pump and nozzle to accurately set nozzle pressure;

Use a graduated container or commercial tip-tester to measure the discharge of clean water over a one minute interval;

Compare the rate to the manufacturer's rate <OR> compare the flow rate from the used tip to the flow rate of a new tip of the same size and shape.

If the flow rate is 10% (or even 5%) more than the ideal rate, replace ALL nozzles, not just the ones that appear damaged. Replace them once a year or at the first signs of deterioration, whichever is first. The cost of renewing an entire set of nozzles is a fraction of the potential cost of wastage and potential crop damage:

Example: An airblast sprayer with 16 nozzles sprays a product that costs $150/hectare (~$60/acre). Nozzle tips are worn by an average 10%, which sprays an additional $15/hectare ($6/acre). 16 new ceramic hollow cone tips and gaskets cost $80 at $5 each. The nozzles pay for themselves in 5.3 hectares (13.3 acres).

The rate of tip wear depends on spray pressure, product sprayed, and the material of which the nozzle is made. Upgrading to a harder, more durable tip can reduce maintenance costs. Never mix nozzle materials on a boom; from softest to hardest: Brass < Stainless Steel < Plastics < Hardened Stainless Steel < Ceramic. Inevitably, all nozzles wear out so be sure to include regular nozzle maintenance and replacement in every spray program. (***Source**: Ontario Tender Fruit and Grapevine Newsletter, Vol. 13, No. 5, June 2009*)

UPCOMING MEETINGS:

July 2, 2009: *New Hampshire Vegetable & Berry Twilight Meeting*. Picadilly Farm, Winchester NH. 5:30-7:30pm. This meeting will focus on developing integrated pest management (IPM) plans for organic diversified vegetable producers, CSA marketing, and more. For info, contact Carl Majewski at carl.majewski@unh.edu or 603-352-4550. 2 pesticide recertification credits.

July 6, 2009: *New Hampshire Grape/Vineyard Twilight Meeting*. Haunting Whisper Vineyards, Danbury NH. 5:30-9:00pm. Cold-hardy grape varieties, grape disease management options, and crop insurance options for grape growers. For info, contact Amy Ouellette at amy.ouellette@unh.edu or 603-225-5505.

July 7, 2009: *Farm to Restaurant Twilight Meeting*. Monadnock Berries, West Hill Rd., Troy NH. 6:30-8:30pm. This meeting will focus on providing producers with information on marketing to local businesses, and on giving area businesses and restaurants a view of farm production in NH. For info, contact Carl Majewski at carl.majewski@unh.edu or 603-352-4550.

July 8, 2009: *New Hampshire Tree Fruit Twilight Meeting.* Brookdale Fruit Farm, Rte 130, Hollis NH. 5:30-8:00pm. Features Tracy Leskey and Starker Wright from the USDA-ARS Appalachian Fruit Research Station in Kearneysville, WV. For info, contact George Hamilton at george.hamilton@unh.edu or 603-641-6060. Pesticide recertification credits awarded.

July 15, 2009: *Massachusetts Fruit Growers' Association Summer Meeting*, **Tougas Family Farm**, 234 Ball St., Northboro, MA. All are invited but you must pre-register. The registration fee includes the program, lunch, and 2 pesticide recertification credits. Check the UMass Fruit Advisor website (www.umass.edu/fruitadvisor) for details at the date gets closer.

July 16, 2009: *Vegetable Research Field Day.* UMass Crops Research & Education Center, S. Deerfield. For more information contact Ruth Hazzard at rhazzard@umext.umass.edu or visit www.umassvegetable.org.

July 20, 2009: *UNH Vegetable & Strawberry Twilight Meeting,* Spring Ledge Farm, 37 Main St., New London, NH 03257. 5:30 – 8:00. 2 pesticide recertification credits. For more information contact Amy Ouellette at amy.ouellette@unh.edu or 603-225-5505.

July 21, 2009: *Organic Weed Control and Cultivation*. Intervale Community Farm, 128 Intervale Rd., Burlington VT. 5-7pm. Cosponsored by NOFA-VT, VT Vegetable & Berry Growers Association and UVM Extension. Free to VV&BGA Members and VOF Certified Farmers, Others $10 for NOFA members, $15 for non-members. For info, please contact NOFA VT at 80-434-4122 or info@nofavt.org.

August 7-9, 2009: *NOFA Summer Conference,* University of Massachusetts, Amherst, MA. Excellent program! For more information visit www.norasummerconference.org.

August 11-12, 2009: *North American Strawberry Growers Association Summer Tour*, Tour highlights include innovative growers, fabulous farm markets and new growing systems, including stacking systems and the Filtrexx growing system. For more information, please visit www.nasga.org , or call Kevin Schooley at 613.258.4587

Aug.13, 2009: *The OrganicA Project: Organic Apple Production.* UVM Hort Farm, 65 Green Mountain Drive Burlington VT. 2:00-5:00pm. Cosponsored by NOFA-VT and the OrganicA project. $10 for NOFA members, $15 for non-members. For info, please contact NOFA VT at 80-434-4122 or info@nofavt.org.

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: *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.

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

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