M I C H I G A N

Blueberry Newsletter

A newsletter from Michigan State University for the Michigan blueberry industry

July 7, 2010 Volume 4, Issue 14

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MICHIGAN STATE UNIVERSITY

News you can use

Disease management. Protect fruit from anthracnose, Alternaria, and other post-harvest fruit rots with broad-spectrum fungicides. Don't forget to participate in the statewide MDA virus survey, which ends on July 16.

Insect management. Fruitworm activity is ending; take down fruitworm traps. Keep monitoring fields for Japanese beetles and blueberry maggot.

Crop development. In Van Buren County, Jersey in Covert is about 14 days from first harvest, and Bluecrop and Blueray in Grand Junction are in the middle of first harvest. In Ottawa County, Blueray in Holland, and Rubel and Bluecrop in West Olive are at late fruit coloring. These fields are about 7 days from first harvest.

Bluecrop ready for harvest in Gd. Junction

Bluecrop close to harvest in West Olive

GROWING DEGREE DAYS — From March 1

	2010		Last Year	
	Base 42	Base 50	Base 42	Base 50
Grand Junction, MI				
6/28	1954	1254	1654	1029
7/6	2183	1420	1835	1146
Projected for 7/12	2374	1563	1985	1249
West Olive, MI				
6/28	1758	1084	1480	891
7/6	1974	1238	1652	999
Projected for 7/12	2178	1394	1793	1093

See http://enviroweather.msu.edu for more information.

SW Michigan

Mark Longstroth
MSU Extension, Southwest

Hot, hot, hot in southwest Michigan! The last few days of June were pleasant, but the first week of July was like a furnace. No rain fell and despite June's rainfall, crops on light sandy soils showed signs of drought stress. Growing Degree Days (GDD) are jumping. Soils are quickly drying out under these hot dry conditions. New plantings on sand may need supplemental irrigation. Be careful of sprays containing Captan, sulfur, or liquid EC formulations of insecticides that can be tough on foliage during hot weather. The forecast this week is for fair weather and highs near 90.

Harvest is well underway. Growers are handpicking for the fresh market. The first picking of Bluecrop is underway. Blueberry maggot flies are the primary insect pest now. Contact insecticides are a good fit to kill fruit fly adults and fruitworm larvae migrating from infested berries in fruit clusters. Mummyberry fruit symptoms continue to appear as the fruit ripens. Anthracnose fruit rot may appear and can infect sound fruit. More blueberry canes are collapsing from phomopsis. Collapse due to flooding from extensive rain in June has also been noticed in some fields (see irrigation article on page 3). Symptoms of flooding look similar to Phomopsis but the leaves on affected canes dry out but do not turn brown. Generally, the entire bush is affected.

MDA Statewide virus survey ends July 16

Robin Rosenbaum
Michigan Department of Agriculture

The Michigan Department of Agriculture (MDA) is conducting a statewide survey of Michigan blueberry fields to determine if blueberry scorch and shock viruses are present in commercial blueberry fields and to mitigate them where practical and feasible. Blueberry scorch and shock have the potential to cause significant losses to the Michigan blueberry industry if they are allowed to become established in the state. Both viruses were detected in Michigan in 2009, but due to swift action by affected growers, the viruses appear to have been eliminated. However, further monitoring is needed to be sure.

In an effort to protect this important industry, MDA requested and was awarded funding under the 2008 Farm Bill to conduct the statewide blueberry virus survey. The survey is being conducted from May 17 to July 16, 2010, during which nearly 35,000 flower, shoot, and foliage samples will be collected from commercial blueberry fields and tested at MDA's plant pathology laboratory, at no cost to the growers. This survey is separate from the virus diagnostic survey that the Small Fruit Pathology program at Michigan State University is conducting for all blueberry viruses. The latter is meant to provide free diagnostic support for blueberry growers in the state. For more information on general blueberry virus diagnosis, contact Jerri Gillett (517-355-7539).

For the statewide blueberry virus survey, it is critical that as many fields as possible be sampled to ensure that the blueberry scorch and shock viruses have been eradicated from the state.

To participate in the survey, please contact the MDA as follows:

Growers in Berrien, Van Buren and Allegan counties - contact Crew Leader Becky Madsen at (517) 599-6716 or Regional Supervisor Mike Hansen at (269) 429-0669.

Growers in Ottawa and Muskegon counties - contact Regional Supervisor Jeff Zimmer at (616) 866-1486.

Growers in other parts of the state - contact Abigail Eaton at (517) 241-3933.

As the leading blueberry-producing state in the country, we can not afford to allow these damaging viruses to gain a foothold in Michigan. Do your part – participate in the statewide blueberry virus survey!

Irrigating blueberries in July 2010

With all the rain we received in June, it seemed that we would never need to irrigate flooded blueberry fields. Indeed the hot weather really made flooding stress an issue in some fields, since warm water holds very little oxygen to allow flooded roots to breath. But with temperatures near 90 and hot drying winds we have really begun to lose soil moisture. Our lighter well drained soils have really begun to dry out. Irrigation is vital for maintaining high yields in commercial blueberries. Blueberries grow best in moist soils. Good soil moisture levels optimize vegetative growth. Blueberries perform best when less than half of the available water has been depleted. Blueberries are shallow-rooted and sensitive to drought stress, and most Michigan plantings are on sandy soils that hold very little water. Drought prior to harvest reduces berry size and yield. Indicating the importance of irrigation, 70% of Michigan blueberries are irrigated. For established plants, the goal is optimizing fruit production for current and subsequent seasons.

Fig 1A-B. Flooding stress in blueberry. These photos show flooding damage in Berkley blueberries. Water stress flooding or drought often have similar symptoms. Some growers may confuse this with Phomopsis cane blight, but the symptoms are different. Water was standing in this field (Fig. 1A) until about a week ago, causing many of the roots to drown. With the increased demand for water from the heat this week, the debilitated root system could not keep up, causing the whole plant to dry out. The close-up photo (Fig. 1B) shows the initial symptoms as the edges of the leaves turned brown and then all the leaves rapidly dried out as the heat sucked most of the water out of the plant; *Photo: M. Longstroth.*

Soil Moisture. Soil water reserves depend on soil texture and plant rooting depth (Table 1). Assume the rooting depth is 12 inches for young plants and 18 inches for older plants. Really light, sandy soils may hold less than 1 inch of available water in the root zone, and half of this can be lost in two warm summer days. Many blueberry fields have slightly elevated areas that dry out quicker than other areas. Hardpan or a shallow water table may limit rooting in other areas of fields. This can be seen in older fields where the plants on sandy high spots and wetter low spots grow more poorly than the rest of the field. These variables complicate irrigation scheduling. As a rule, irrigate to maintain drought-prone areas of your field.

Evapo-transpiration (ET) is the evaporation from the field, plus the water lost by the plant (transpiration). Under the hot conditions we have seen this month, Blueberry fields in southwest Michigan are losing 0.18 to 0.24 inches per day. Daily Potential ET values are available on the Michigan Automated Weather Network (MAWN) (http://www.agweather.geo.msu.edu/mawn/irrigation/). The potential ET is part of the report given for daily data. These MAWN Potential ET values are the best estimates of water use in blueberry fields. Maximum water use during the preharvest fruit growth stage is probably 0.20 to 0.25 inches and these are the values we have seen this first week of July. Allowable soil moisture depletion in blueberries is considered to be 50%, so irrigate when half of the available water is used. This means that irrigation should be applied before 0.2 to 0.6 inches water is lost (3 days of 0.20

inches ET) from sands and loamy sands, or 0.8 to 1.5 inches (4 to 7 days) are lost on sandy loam or loam soils.

Irrigation scheduling allows you to replenish the soil water while reducing the amount of water used and loss of nutrients. You need to how much water the soil can hold. If you know how much water the plants are using, you should irrigate when the plants has used half the available water. For example, a root zone of 18 inches on a loamy sand soil (0.07 inches water per inch of depth) holds 1.3 inches of available water:

(18 inches) x (0.07 inches water/inch) = 1.3 inches water

If the root zone were depleted by 50%, you would need to apply 0.65 inches:

(0.5 depletion) x (1.3 inches) = 0.65 inches to apply

If the ET for the last several days was 0.25 inches you would need to irrigate every 2 days; for 0.2 inches every 3 days. The evapotranspiration rate varies during the year depending on the amount of leaves on the plant and the heat and relative humidity. Temperature is the most important factor; heat increases ET much more than humidity decreases ET.

Sprinkler Systems. The amount of water applied by sprinkler systems is determined by the size of the nozzle and the water pressure at the nozzle. For example a 9/64-inch nozzle at 45 psi will deliver about 0.15 inches an hour. A system that delivers 0.15 inches water per hour, delivers 0.6 inches in 4 hours. However, about 20 to 30 % of water from overhead sprinklers may be lost to evaporation, so increase the operating time accordingly. Also, irrigation systems are not completely uniform; they apply more water in some areas than others. The uniformity of sprinkler systems can be measured, but they usually have only 70% uniformity. This means to recharge all areas of the field, 30% more water than calculated needs to be applied. In our example, operating time should be increased 20% for evaporation losses, plus 30% due to non-uniformity. So, increase the operating time of 4 hours by 50% to 6 hours to ensure that all areas receive 0.6 inches. With the importance of GAP inspections and certification this year, sprinkler systems are of increased concern. Because the irrigation water comes in contact with the fruit GAP certifiers require tests of the irrigation water. Irrigation water from open ponds or other surface water sources can easily be contaminated with bacteria and if water tests indicate that the bacteria levels are higher than the levels in the growers GAP plan then irrigation should be delayed until the problem is remedied.

Table 1. Available water in a blueberry root zone as affected by soil texture and rooting depth.

	Available water (inches)	
Soil texture	**Per inch of depth**	**In root zone (12-18 inch depth)**
Sands	0.03	0.4 - 0.6
Loamy sand	0.07	0.8 - 1.3
Sandy loam	0.13	1.6 - 2.3
Loam	0.17	2.0 - 3.1

Trickle Irrigation. Trickle irrigation systems can be run daily, or on the same schedule as sprinkler irrigation systems. The area wet by a trickle system is much smaller than the entire field wet by sprinkler systems. The application rate for lower volume trickle systems (48" spacing, 0.42 gph emitters) is about 0.17 inches/hr. The more common moderate flow systems (24" spacing, 0.42 gph emitters) deliver about 0.3 inches/hr. Since evaporation and uniformity are not significant in trickle systems we do not need to increase the application time. We would need to run the lower volume system twice as long to apply the same amount of water. These systems can be run at one to two hours every day to replace plant water use.

There are several rules of thumb for trickle irrigation systems. For young plants apply 20 gallons/day per 100 feet of row. Mature plantings apply 35 gallons/day per 100 feet of row. Ontario, Canada estimates that peak demand of highbush blueberry is about 4.5 G/day (18 liters/day).

Mark Longstroth
Michigan State University Extension, Southwest

Control of post-harvest fruit rots in blueberry

Fruit rots in blueberries, such as anthracnose fruit rot (*Colletotrichum acutatum*) and Alternaria fruit rot (*Alternaria* spp.), are generally separated into two types: field rot and post-harvest rot. The former can be seen on berries in the field before harvest, and is especially common when berries are left on the bushes too long. Post-harvest rot can develop on berries that looked fine at harvest. These infections can result from spores splashed by rain from rotting berries in the field or occur by contact with contaminated berries and equipment surfaces during harvest or processing. Often, these berries look healthy at harvest, but start to rot soon after. Post-harvest fruit rot development may be slowed down by refrigerated storage, but can resume on the supermarket shelves, lowering fruit quality. These infections can also contribute to high microbial counts in frozen berries, leading to rejection of fruit lots by some buyers. The most important cultural control measures are timely harvesting, sanitation of equipment surfaces and storage containers, and rapid cooling of harvested fruit in reducing post-harvest fruit rot incidence, particularly at the later harvests when disease pressure is generally higher.

While fruit rot is often not visible for a period until the berries ripen or even after harvest (this is called "latent infection"), it is prudent to assume that there will be fruit rot in a field which has had problems in previous years. Warm, wet weather conditions favor fruit rot development. Latent infections increase rapidly during the harvest season, with later harvests having significantly more latently infected fruit than the first harvest (Fig. 2). Research has also shown that low levels of visible anthracnose fruit rot in the field correlate with high levels of latent (invisible) infection. In 2008, we found that when you see fruit rot on at least one cluster per bush in the field before harvest, 50% of the remaining blue fruit is already are latently infected (Fig. 3). These latent infections can manifest themselves after harvest. While seasonal and dormant sprays should be used to reduce primary fruit rot infections, applications after the first harvest may be beneficial in preventing additional latent infections.

Examples of fungicides that can be used during fruit development and ripening are discussed below. The strobilurins (**Abound, Cabrio, Pristine**) are all effective against anthracnose fruit rot, with Pristine having the most broad-spectrum activity since it contains two different active ingredients. However, it is also the most expensive of the three strobilurin fungicides. Adding a protectant fungicide with a different mode of action (e.g., Captan, Ziram) can broaden the activity of Abound or Cabrio. **Ziram** (ziram) and **Captan** (captan) have moderate to good broad-spectrum activity against fruit rots (efficacy better at higher rates). However, both of these products have less favorable toxicological profiles than newer fungicides and may leave visible residues, so it may be better to avoid application of these fungicides on the fruit close to harvest. In addition, the PHI for Ziram is 14 days. All strobilurins are supposed to have moderate to good activity against Alternaria fruit rot and become quickly

Fig. 2. Latent anthracnose fruit infection in Michigan fields in 2007.

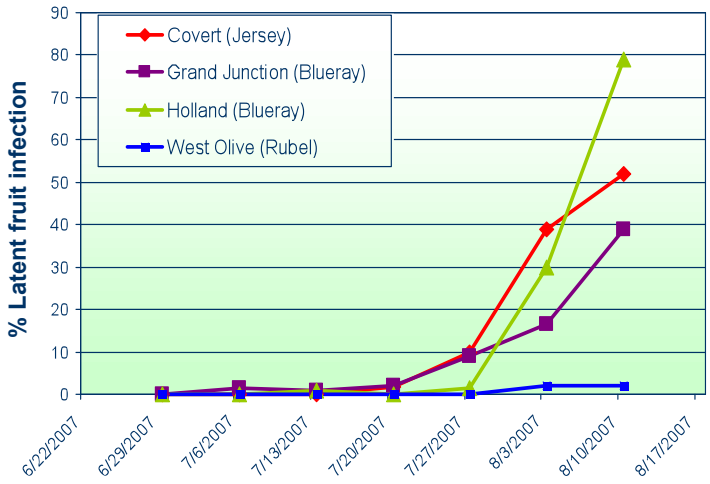
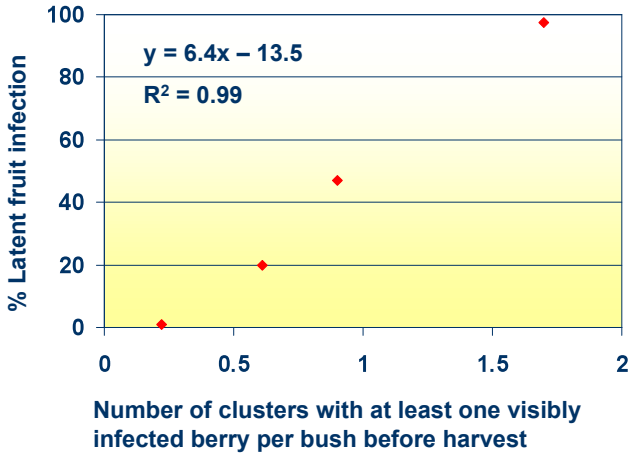
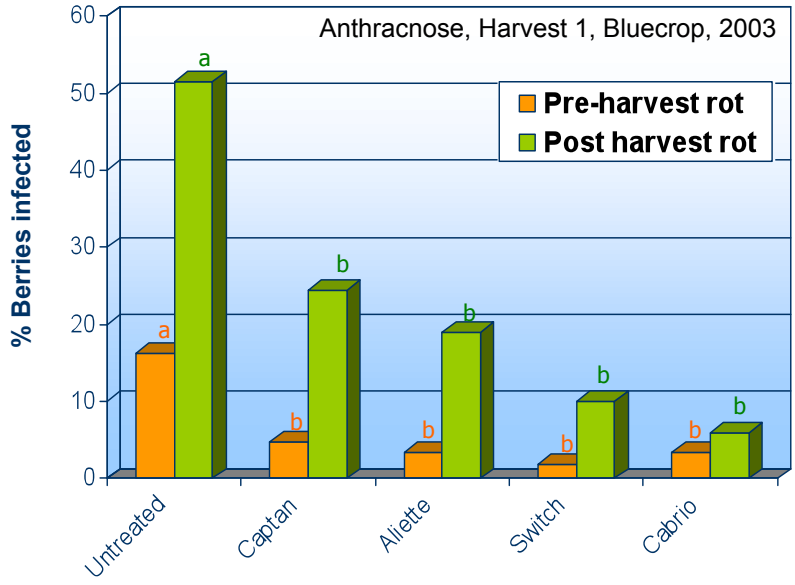


Fig. 3. Correlation of pre-harvest infection incidence with post-harvest infection incidence.



rainfast since they are locally systemic. **Switch** (cyprodinil and fludioxonil) has locally systemic properties and provides excellent simultaneous control of anthracnose, Alternaria, and Botrytis fruit rots. Thus it may be a good choice if several fruit rots are a concern. **Omega** (fluazinam) has good activity against anthracnose fruit rot and moderate activity against Alternaria fruit rot. **Captevate** (captan and fenhexamid) at the high rate will provide good control of anthracnose as well as Botrytis fruit rot, but this disease tends to be less common in Michigan. Captevate is also fairly expensive. **Aliette** (fosetyl-Al) is a highly systemic fungicide that provides good control of anthracnose, Alternaria fruit rot, and Botrytis fruit rot. Phosphite fungicides like **ProPhyt** and **Phostrol** are similar to Aliette in their mode of action and also have moderate to good activity against anthracnose fruit rot. **Regalia** (giant knotweed extract) has moderate activity against anthracnose fruit rot when applied with a spreader-sticker. It can be used in a tank-mix with other fungicides to improve overall disease control and works via boosting natural plant defenses against invading pathogens. Regalia has a different mode of action of most other fungicides available to blueberry growers and is a natural product that can be used in organic production. Do read the label and consider the pre-harvest and restricted entry intervals for the various fungicides before using them.

Fig. 4. Fungicide efficacy against pre- and post-harvest anthracnose.



Annemiek Schilder
Department of Plant Pathology
Michigan State University

Insect update

Very low numbers of cranberry fruitworm moths were caught at all the farms we scouted, and the flight of this pest is essentially over for the season. Growers and scouts can remove cranberry fruitworm (and cherry fruitworm) traps from fields in preparation for harvest. Cranberry fruitworm eggs were not seen at any of the monitored farms; we are at the end of cranberry fruitworm egglaying at the farms we monitor. Cherry fruitworm moths and eggs were not observed at

Fig 5. Appearance of cherry fruitworm damage at this point in the season; *Photo: K. Mason.*

any of the monitored farms, and flight of that pest is also over. Single berry damage (cherry fruitworm or early cranberry fruitworm feeding) was observed at all farms, and the amount of damage this week was very similar to what was found last week. Damage levels still remain well below 1% of berries damaged in the fields we monitor. At this time, berries damaged by cherry fruitworm will appear shriveled and will soon fall off the bush (Fig. 5). No larvae were found in any of the damaged berries, suggesting that cherry fruitworm larvae have either been killed or dropped from the fruit. Multiple berry damage, which indicates advanced cranberry fruitworm feeding, was not seen at any of the scouted farms.

Fields should be checked for fruitworm feeding damage one last time before harvest. Record the level and location of damage to help assess control in the field as well as identify hotspots to keep in mind for planning for next season.

Low numbers of small aphid colonies (1 to 3 individuals per shoot) were seen at all the scouted farms except in Covert. Parasitized aphids were observed at the West Olive and Grand Junction farm. Check bushes for aphid colonies, particularly on farms where there are varieties that are susceptible to shoestring virus.

No blueberry maggot flies were caught at any of our monitored farms. Growers and scouts should have blueberry maggot traps deployed in fields, and traps should be check at least once per week (twice per week, if possible) through harvest. For more information about monitoring for this pest, see the blueberries.msu.edu website or the June 8, 2010 edition of the Michigan Blueberry Newsletter. We are still receiving reports of maggot fly captures at high pressure sites in southwest Michigan.

Japanese beetles are emerging. All of our monitored fields were scouted for Japanese beetle, and low numbers of beetles (less than 1 beetle per bush) were seen at the Grand Junction, Covert and Holland farms. Light Japanese beetle feeding damage was observed on leaves and fruit at the Holland farm. Fields should be monitored weekly for the presence of Japanese beetles from now through harvest. To monitor for Japanese beetle, examine 10 bushes on the field border and 10 bushes in the field interior and record the number of beetles on each bush. Keep in mind Japanese beetles are normally more common adjacent to grassy areas on sandy soils, and in areas where soils remain moist in July and August. Regular monitoring will aid growers and scouts in timing control measures to keep fields clean of Japanese beetles before harvest, and reduce the possibility of contamination during picking. Read more about Japanese beetle at the blueberries.msu.edu website.

Lecanium scale crawler emergence is tailing off, so fields that need to be treated for this pest should be treated soon before crawlers settle down and begin to form the waxy covering. See the longer article in today's edition of the newsletter.

Keith Mason & Rufus Isaacs
Department of Entomology
Michigan State University

Table 2. Insect scouting results.

Farm	Date	CFW moths per trap	CBFW moths per trap	BBA infested shoots (%)	BBM adults per trap	JB per 20 bushes
			VAN BUREN COUNTY			
Covert	6/28	0	2	0	0	3
	7/6	0	2	0	0	2
Grand Junction	6/28	0	0	10	0	0
	7/6	0	1	10	0	0
			OTTAWA COUNTY			
Holland	6/28	0	2	20	0	5
	7/6	0	2	10	0	15
West Olive	6/28	0	1	0	0	0
	7/6	0	1	5	0	0

Lecanium scale crawler emergence declining in West Central Michigan

Lecanium scales have been found at many west-central Michigan blueberry farms this summer (Figure 6). We have been monitoring the emergence of Lecanium scale crawlers this summer as part of a GREEEN-funded project to determine the phenology of this pest. This information is critical for identifying the optimal timing for managing this pest with insecticides that are active on the crawler stage. At sites high infestation that require control, it is best to wait until crawlers emerge from under the protective waxy scale before applying treatments to protect bushes. The graph (Fig. 7) shows the timing of crawler movement from under the adult scales. These samples were from approximately weekly samples at three farms in northern Holland/West Olive. We used double-sided sticky tape (Fig. 8) placed near colonies of Lecanium scale and then checked them under a microscope to determine the number trapped.

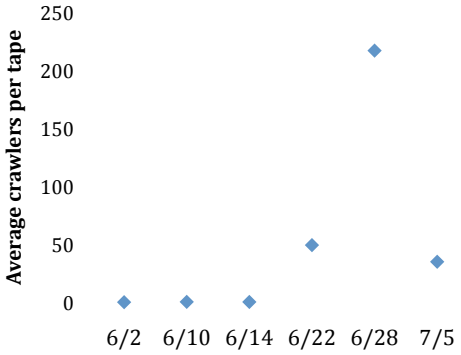


Fig 7. Lecanium scale crawler emergence peaked in late June; *Data: N. Hahn.*

As you can see, there was rapid increase in scale crawler density in late June and this has tailed off in the past week. These results indicate that the window of opportunity for scale control is closing in west Central Michigan, so any sites that require control should be treated soon while the crawlers are still small. Many fields will have been sprayed for other reasons – i.e. to protect them from blueberry maggot and Japanese beetle, and these treatments will help to keep scale in check. Continued monitoring would be well advised in infested fields to check that a new generation of scale is not developing. The aim is to prevent scales from developing on this year's growth so they are not present for the 2011 season.

There is significant biocontrol working on these scale colonies: we have seen parasitic wasps emerging from scales collected in crop fields this spring, and fungal pathogens have also attacked colonies in some wooded areas near blueberry fields. In recent sampling, only 5% of scales were alive, but each surviving scale can produce hundreds of crawlers, so they have a high potential for reproduction.

Once scale crawler emergence is identified, control of Lecanium scale is possible using effective insecticides. These include the selective growth regulator Esteem which is highly active on scale while being safe to natural enemies. Other more broadly-active chemical classes expected to control Lecanium scale includes the neonicotinoids or pyrethroids. Neonicotinoids include Provado, Assail, Actara, and Scorpion and these products are systemic, being absorbed into the plant tissues after application and therefore resistant to washoff. Pyrethroids such as Danitol, Mustang Max, and Baythroid will provide quick knockdown of the scale crawlers. However, pyrethroids can also disrupt biological control for this and other pests so they should be used with care. If infestations are found after the crawlers have settled and formed their protective covering this fall, a delayed dormant oil application next spring may be considered, though the landscape entomologist Dr. Dave Smitley of MSU has mentioned to us that oils have not worked very well against soft scales such as Lecanium scale. For organic growers or those with light infestations, this option may still be worth trying next spring to reduce scale populations on bushes.

Fig 6. Lecanium scales have been visible on blueberry branches this spring; *Photo: N. Hahn.*

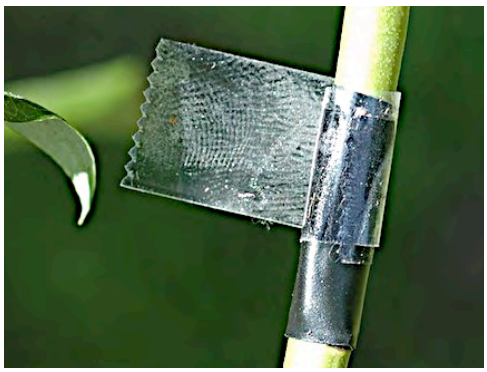


Fig 8. Double-sided sticky tape is used as a trap for monitoring the timing of crawler emergence; *Photo: N. Hahn.*

Rufus Isaacs & Noel Hahn
Department of Entomology
Michigan State University

2010-11 Grower Events

SEPTEMBER 28, 2010 1:00-4:00PM
Trevor Nichols Research Complex Field Day
Location: Trevor Nichols Research Complex, Fennville
Education program information: John Wise, 269-330-2403
Website: http://www.maes.msu.edu/tnrc/calendar.htm

The field day will focus on insect and disease research and efficacy trials that were carried out this season by Larry Gut, Rufus Isaacs, Annemiek Schilder, George Sundin, Mark Whalon and John Wise.

OCTOBER 12-15, 2010
NABC-USHBC Fall Meeting
Location: Amway Grand Plaza Hotel, Grand Rapids

OCTOBER 12-13, 2010
National Blueberry Exposition - ***runs concurrent with the NABC-USHBC fall meetings***
Location: Amway Grand Plaza Hotel & DeVos Place Conv. Center
Contact expo@blueberries.com for more information.

DECEMBER 7-9, 2010
Great Lakes Fruit, Vegetable, and Farm Market Expo
Blueberry sessions: Wed, Dec. 8, morning and afternoon
Location: DeVos Place Convention Center, Grand Rapids
Education program information: Eric Hanson, 517-355-5191, x1386
Website: http://www.glexpo.com/index.php

FEBRUARY 9-10, 2011 ***(Tentative)***
Southwest Hort Days
Location: Lake Michigan College, Benton Harbor
Education program information: Mark Longstroth, 269-330-2790
Website: http://www.canr.msu.edu/vanburen/swhort.htm

MICHIGAN STATE UNIVERSITY EXTENSION

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