M I C H I G A N

Blueberry Newsletter

A newsletter from Michigan State University for the Michigan blueberry industry

June 29, 2010 Volume 4, Issue 13

MICHIGAN STATE UNIVERSITY

News you can use

Disease management. Don't forget to participate in the statewide MDA virus survey, which ends on July 16. Monitor fields for signs of mummy berry fruit infection and cane collapse. Protect fruit from anthracnose, Alternaria, and other fruit rots with broad-spectrum fungicides.

Insect management. Fruitworm activity is ending. Monitor fields for Japanese beetles and maggot flies. Blueberry maggot fly catches have been high this past week in some fields with a history of this pest. Be sure to check traps regularly to identify maggot flies. Go here or here for more information and photos of this pest.

Crop development. In Van Buren County, Jersey in Covert is at fruit coloring, and Bluecrop and Blueray in Grand Junction are about 7-10 days from first harvest. In Ottawa County, Blueray in Holland, and Rubel and Bluecrop in West Olive are at fruit coloring.

Bluecrop nearing 1st harvest in Gd. Junction

Blueray at fruit coloring in Holland

GROWING DEGREE DAYS — From March 1

	2010		Last Year	
	Base 42	Base 50	Base 42	Base 50
Grand Junction, MI				
6/21	1726	1081	1409	840
6/28	1954	1254	1654	1029
Projected for 7/5	2115	1362	1810	1129
West Olive, MI				
6/21	1552	933	1241	708
6/28	1758	1084	1480	891
Projected for 7/5	1941	1211	1628	983

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

SW Michigan

Mark Longstroth
MSU Extension, Southwest

The last week of June was like the rest of the month with highs near 80 and lows near 60. Thunderstorms and unsettled conditions marked the week's weather. Most rain fell on Tuesday, Wednesday and Sunday, with accumulations of one to three inches. June has been very wet. June's rainfall totals were very variable; areas to the south and close to the big lake received 8 to 10 inches while areas away from the lake received only about 5 to 6 inches. Growing Degree Days (GDD) are ahead of normal, and fruit is ripening about 7 to 10 days ahead of normal. Soils are wet, and ponding in the fields is common. The forecast this week is for fair weather and highs in the 70's.

Fig 1. Frost damage near the calyx cup on some berries; *Photo: M. Longstroth.*

Harvest is underway. Growers are handpicking early varieties for the fresh market. Frost rings are common in the first ripening fruit in some fields (Fig. 1). We are still catching a few cranberry fruitworms, but 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 a cluster. Mummyberry fruit symptoms continue to appear as the fruit ripens. Anthracnose fruit rot may appear and can infect sound fruit. Some blueberry canes are beginning to collapse from phomopsis. These can be confused with blueberry shoot borer injury. This injury is common in some fields. The new leaves at the end of the shoot wilt and die back to where the insect has burrowed into the stem.

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!

Disease update

This week all scouted plots were at early fruit ripening. Twig blight symptoms were somewhat reduced in incidence compared to last week at all four scouted plots, indicating no or very few new twig blight infections have occurred since bloom. Infected twigs may be harder to see with increased foliage, which probably explains the apparent reduction. Twig blights can lead to wilting of developing fruit clusters due to death of the vascular tissue leading to the cluster. Mummy berry shoot strikes have almost completely disappeared in all four scouted plots, and have likely fallen off due to wind and rain in recent storms. Figure 2 shows a late-stage mummy berry shoot strike, which can be identified by the "shepherd crook" shape and the bleached area in the "crook". A few mummy berry-infected fruits were just starting to show external symptoms on the bush and on the ground (Fig. 3) at two of the sites near Grand Junction and West Olive, with the highest average being 2.8 newly mummified fruits at the West Olive site. Most of the infected berries were not showing external symptoms but internally the infected berries had significantly more fungal growth when compared to two weeks ago (Fig. 4). Do not confuse mummy berry symptoms with those of cranberry or cherry fruit worm infection, which may lead to partial purpling of berries. However, with insect infestation, there always is an entry hole and there may be insect frass and tunneling visible when the fruit is cut open.

Fig 2. Extreme late stage mummy berry shoot strike. Note the typical Shepherd's crook appearance and the bleached area on the petiole; *Photo: T. Miles.*

Fig 4. Mummy berry infected fruit showing the fungus completely colonizing the carpels and beginning to lay down a thick outer wall in preparation for overwintering; *Photo: T. Miles.*

Mummy berry

During the mummy berry fruit infection the fungus develops internally and remains invisible while the berries are green; however, during fruit ripening, the fungus fills the carpels of the fruit and starts to lay down a thick, gray wall in preparation for overwintering. Sometimes not all carpels are colonized by the fungus, resulting in lopsided or partial mummy berries. Shallow ridges will appear on the outside of the fruit and the fruit will turn tan brown in color. In the early stages, the fruit is still soft and may feel rubbery. In the later stages, the fruit dries up and becomes harder and falls to the ground.

Fig 3. Mummy berry infected fruits that fell to the ground. Note the wrinkled appearance, lack of insect damage (no holes), and the partial tan to purple discoloration of the berries; *Photo: T. Miles.*

Fig 5. Remnants of mummy berry shoot strikes on blueberry twig, which is also showing twig blight and shriveling berries. Shoot strikes may provide an entry point for Phomopsis infection; *Photo: T. Miles.*

However, infected berries often remain in fruit clusters in the bush, which causes problems at harvest. Over the past three seasons (2007-2009), newly mummified fruits on any particular bush were well correlated with the incidence of apothecia and shoot strikes under/on the same bush, illustrating that the infection is more localized than we had previously assumed. In fact, the best chances of finding mummified berries are close to old shoot strikes (Fig. 5). Additionally, since fruits are beginning to ripen it is important to start scouting for fruit rots as they can occur in the field and post harvest.

Tim Miles & Annemiek Schilder
Department of Plant Pathology
Michigan State University

Table 1. Disease scouting results *biweekly* — *Data updated*

Farm	Date	Avg number of shoot strikes per bush*	Avg number of blighted blossom/ shoots per bush	Avg number of newly mummified fruits per bush
		VAN BUREN COUNTY		
Covert	6/14	0	6.9	not present
	6/28	0	3.9	not present
Grand Junction	6/14	0.3	1.3	internal symptoms only
	6/28	0	1.1	1.2
		OTTAWA COUNTY		
Holland	6/14	0	2.0	not present
	6/28	0	1.6	not present
West Olive	6/14	6.5	2.0	internal symptoms only
	6/28	0.1	1.9	2.8

**Average of 10 bushes.*

Cane anthracnose found in some blueberry fields

This season, it is not just Phomopsis that is infecting blueberries. One might also see unusual lesions on green blueberry canes that are dark brown to black with light brown to gray centers, circular or oval and fairly sharply delineated (Fig. 6). Lesions vary in size, from the several millimeters to over 1 inch in length. Young lesions look like small reddish spots on the stem (Fig. 7). Lesions may be centered around a leaf scar or not (Fig. 8). These lesions are caused by the fungus *Colletotrichum acutatum*, the causal agent of anthracnose fruit rot. In contrast, Phomopsis lesions tend to be more elongated and uniformly brown, often girdle the entire stem, and may be flattened with more diffuse margins. The lesions may also be mistaken for Fusicoccum canker, but Fusicoccum lesions are usually described as "bull's eye" lesions and mostly occur in northern growing areas of the state. So far, anthracnose lesions have only been observed in a few Jersey fields, but may be present in other varieties as well. What is most striking are the fruiting structures (acervuli) in concentric circles on the surface of these lesions (Fig. 9). Acervuli look like small cracked blisters when viewed close-up (Fig. 10). Salmon-pink spore masses may be seen on canes in the field under humid conditions, but if you are not sure, keep cane pieces with lesions on a moist paper towel in plastic container for a couple of days. Anthracnose lesions will produce salmon-pink spore masses, whereas Phomopsis will produce creamy white exudates in a random pattern. Both can start to look like curly strings if the humidity is just right, but Phomopsis spores have more of a tendency to do so. Anthracnose lesions are initially fairly superficial, only killing the bark, but are assumed to develop further to girdle and kill larger portions of canes.

Fig 6. Advanced anthracnose lesions on blueberry stem; *Photo: A. Schilder.*

Fig 7. Young anthracnose lesions on blueberry stem; *Photo: A. Schilder.*

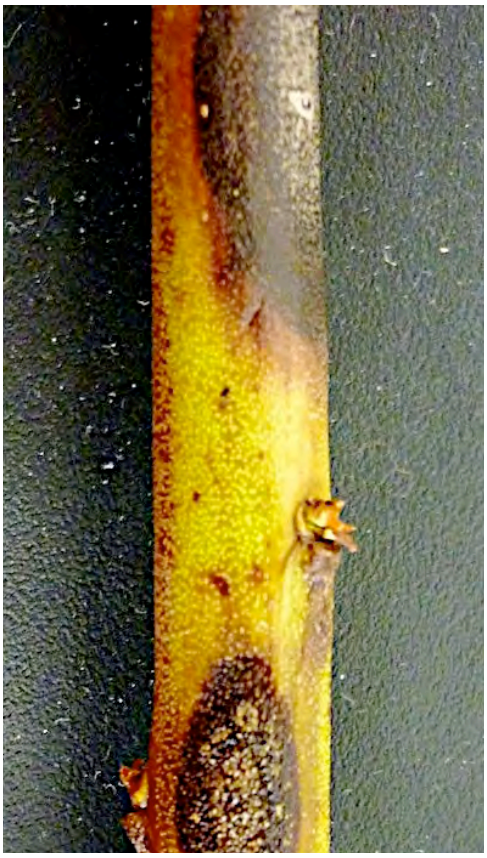

Fig 8. Anthracnose lesions on blueberry stem no associated with leaf scars; *Photo: A. Schilder.*

Fig 9. *colletotrichum acutatum* fruiting structures (acervuli) in ring-like pattern around leaf scar; *Photo: A. Schilder.*

Fig 10. Close-up of blisterlike acervuli of *C. acutatum*; *Photo: A. Schilder.*

The occurrence of anthracnose cane lesions is rare, though it has been reported before by researchers in Japan and was observed in Ontario and Michigan in 2003 and 2004. The infections likely took place in 2009 and may be related to the rainy weather later in the season, which may have provided sufficient wetness to allow infection of young green canes at a time that spores were abundant, e.g. during fruit ripening and harvest season. In addition, some canes were extremely vigorous probably due to heavy fertilizer use. While studies have not been done specifically to determine the best methods to control cane anthracnose, they are likely to be similar to those that would be employed for Phomopsis: pruning out diseased and dead canes, applying lime sulfur as a delayed dormant spray, and fungicides on a regular basis through the season. The same fungicides that work against anthracnose fruit rot will work against cane infection: Bravo, Captan, Ziram, Abound, Cabrio, Pristine, Switch, Omega, and Aliette. Consider the pre-harvest interval in each case. Sprays may be continued after harvest if canes are growing very vigorously and the disease has been a problem in that field in the past. Make sure that the base of the bush also gets covered well. The goal is to protect young and emerging green canes from infection.

Annemiek Schilder
Department of Plant Pathology
Michigan State University

Insect update

Low numbers of cranberry fruitworm moths were caught at all the farms we scouted, except the Grand Junction farm. The number of moths continues to decline and the flight of this pest is nearing the end for this season. Cranberry fruitworm eggs were not seen at any of the monitored farms, also indicating we are at the end of cranberry fruitworm egglaying at the farms we monitor. Multiple berry damage, which indicates advanced cranberry fruitworm feeding, was not yet seen at the scouted farms.

Cherry fruitworm moths and eggs were not observed at any of the monitored farms. 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 (Fig. 11). Damage levels still remain well below 1% of berries damaged in the fields we monitor.

Fig 11. Look out for developing fruitworm damage, seen as a small entry hole or early-ripening fruit and/or insect frass. Single berry damage typical of cherry fruitworm feeding or early cranberry fruitworm feeding (ABOVE). Multiple berry damage indicative of advanced cranberry fruitworm feeding (BELOW); *Photos: K. Mason.*

Fields should be checked for fruitworm feeding damage until harvest to determine the level of control in the field and to identify hotspots for future treatments. For more information on these pests, see the fruitworm pages on the blueberries.msu.edu website.

Low numbers of small aphid colonies (3 to 5 individuals per shoot) were seen at all the scouted farms except in Covert, and we are still getting reports of aphid activity at many other farms in southwest Michigan. Parasitized aphids were not observed. 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 already have blueberry maggot traps deployed in fields. For more information about monitoring for this pest, see the blueberries.msu.edu website or the June 8th newsletter.

Japanese beetles are emerging (Fig. 12). All of our monitored fields were scouted for Japanese beetle, and beetles were seen at the Covert and Holland farms. Japanese beetle feeding damage was not observed on leaves or fruit. Fields should be monitored weekly until last harvest for the presence of Japanese beetles. 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. Regular monitoring, especially close to harvest-time, 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.

Fig 12. Adult Japanese beetle; *Photo: P. Jenkins.*

In regions of the state with high Lecanium scale populations on bushes, we have observed emergence of the tiny crawlers in the past week. This means that it is time for application of crop protectants to prevent crawlers from becoming established. See the article later in this issue for more details.

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	6/21	0	4	0	0	0
	6/28	0	2	0	0	3
Grand Junction	6/21	0	1	10	0	0
	6/28	0	0	10	0	0
			OTTAWA COUNTY			
Holland	6/21	0	4	5	0	0
	6/28	0	2	20	0	5
West Olive	6/21	0	3	0	0	0
	6/28	0	1	0	0	0

Lecanium scale update

Lecanium scale has been found in blueberry fields this summer, especially around the Holland/West Olive region. They have also been found in some vineyards in the northwest region. The waxy scales are small and brown (3-4 mm long) and typically on the new growth from last year. The high densities of scale will cause honeydew on the foliage and fruit beneath the colonies, and this can cause problems with growth of sooty mold. Additionally, there may be reduced growth of new foliage on shoots that are heavily-infested.

Our earlier article on this subject highlighted the need to wait until crawlers emerge from under the protective scale before applying treatments to protect bushes, and we have now observed crawler movement from the adult scales. In our weekly sampling for scale through June, the average number of scale crawlers on sticky tape traps were as follows: zero on June 2, 0.25 on June 10, 0.2 on June 14, and 49.1 on June 22. This rapid increase in scale crawler density indicates that this week would be the right time to protect fields where high scale density was found this spring. This will prevent scales from settling on this year's growth and continuing their development.

Scouting to identify the start of crawler emergence can be done in your own fields by weekly checking of double-sided sticky tape placed near scale colonies, or by regular checking of colonies with a 10 x hand lens. The scale crawlers will be visible around the adult scales, moving across the vine shoot surface. They are about ½ mm long and yellow.

We have already 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, so some natural biological control is underway. In recent sampling, scale populations in woods had less than 5% survival but each surviving scale can produce hundreds of crawlers, so they have a high potential for reproduction.

Once scale crawler emergence is identified, protection of bushes is possible using effective insecticides. We have conducted a small demonstration trial in a West Olive farm this spring, comparing scale control in a field receiving these three programs for fruitworm control and measuring the control of scale. These programs included two applications applied 14 days apart after bloom 1) Guthion and then Imidan, 2) Assail applied twice, 3) Mustang Max applied twice. All of these programs provided complete control of scale, with no surviving adult scale a week after the final treatment. These results and the further details below indicate that many growers managing blueberry maggot and Japanese beetles at this time should be achieving control of Lecanium scale. For this pest, it will be important to get coverage through the canopy including the lower branches to make sure all the new young growth is protected.

The Landscape Entomologist at MSU, Dr. Dave Smitley, who has plenty of experience with Lecanium scale in shade trees recommends use of neonicotinoids or pyrethroids for control of Lecanium scale crawlers. 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. Dr. Smitley of MSU has also mentioned to us that oils have not worked very well against soft scales such as Lecanium scale, but that option may be something organic growers would be interested in trying next spring at delayed-dormant timing to try and reduce scale populations on bushes.

Rufus Isaacs & Noel Hahn
Department of Entomology
Michigan State University

2010-11 Grower Events

Our 2010 seasonal grower meetings have come to a close. Many thanks to Carini Farms, Cornerstone Ag, Jim Getzoff, and True Blue Farms for hosting this year's meetings. Best wishes for a productive harvest!

UPCOMING 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.

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

Funding for this newsletter is provided by grants from the USDA, EPA and Project GREEEN.