M I C H I G A N

Blueberry Newsletter

A newsletter from Michigan State University for the Michigan blueberry industry

August 3, 2010 Volume 4, Issue 16

MICHIGAN STATE UNIVERSITY

News you can use

Disease management. Fungicide sprays immediately after harvest may help protect canes injured by mechanical harvesting from infection by Phomopsis in susceptible cultivars. Since harvest is early, fungicide sprays after harvest may also help limit anthracnose and Phomopsis bud infections. Start preparing mummy berry nurseries for next year.

Insect management. Blueberry maggot flies are still being captured. Japanese beetle numbers are declining.

Crop development. In Van Buren County, Jersey in Covert is beginning second harvest, and Bluecrop and Blueray in Grand Junction are ready for third harvest. In Ottawa County, Blueray in Holland, and Rubel in West Olive is ready for second harvest. Bluecrop in West Olive is in the middle of second picking.

SW report. Blueberry harvest continues and is moving quickly; growers are picking Jersey and Elliot. Many Growers believe they will be finished in about 2 weeks. Blueberry maggot is the primary insect pest. Anthracnose is the most common fruit rot on ripe fruit. Blueberry cane collapse from phomopsis is still showing up.

Jersey ready for 2nd harvest in Covert

Bluecrop ready for 2nd harvest in W. Olive

GROWING DEGREE DAYS — From March 1

	2010		Last Year	
	Base 42	Base 50	Base 42	Base 50
Grand Junction, MI				
7/26	2871	1948	2339	1491
8/2	3091	2112	2529	1625
Projected for 8/9	3322	2287	2736	1776
West Olive, MI				
7/26	2626	1729	2125	1314
8/2	2836	1884	2298	1431
Projected for 8/9	3084	2075	2487	1563

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

Disease update

This week all scouted plots have been harvested multiple times and we observed more anthracnose fruit rot symptoms and continued to see newly formed mummy berry infected fruits at all of the sites.

Mummy berry. The number of new mummy berries decreased at both the Grand Junction and the West Olive site with an average of 12.6 and 68.9 newly mummified fruits being detected, respectively. This decrease is likely the result of disturbance by the repeated mechanical harvesting, because this process can actually push newly formed mummified fruits into the soil. Burying mummies might actually help the fungus overwinter by insulating them from extreme air temperatures and by ensuring moist conditions. Despite the decreased numbers from previous weeks, newly formed mummies were still very visible and relatively straightforward to scout for as most of the fruit epidermis was still intact (giving the berry a whitish appearance) (Figs. 1 and 2).

Preparing mummy berry nurseries. In the next few years we will be assessing the effectiveness of mummy berry "nurseries" for monitoring development of the fungus in the spring at different locations within Michigan. Ideally, each grower would be able to monitor the mummy berry fungus on his/her own farm, since germination and development are mainly driven by soil moisture and temperature over the winter and spring and soil conditions vary from farm to farm. A mummy berry "nursery" consists of a concentration of mummified berries in one to three locations on a farm (Fig. 3). Multiple locations will help cover variability in soil type and moisture. Having the mummies in known locations will make it easier to find them and monitor them in the spring. The nursery sites are selected based on conditions that are expected to be conducive to mummy berry germination, e.g., moist, low-lying areas with high water table, for instance, areas that are normally prone to mummy berry infection on your farm. Also, you want to place them where you can easily access them and where they are not likely to be disturbed by farm machinery, e.g., between two bushes at the end of a row. Mark the "nurseries" with a colorful stake or flag so you can easily find them again to inspect them in the spring.

Because it is fairly easy to scout for mummies at this time of year, this is a good time to collect fruit to construct your own nurseries. Begin by collecting 50-150 mummies already present in the field. Clear an area of about 1 square foot of weeds and leaves or other debris. Sprinkle 50 mummies on the ground per location. Step on them to press them into the soil ensuring good soil contact and sprinkle them with a thin layer of dirt (about 1/8 inch thick).Then treat the area like any other area on your farm, allowing leaves to fall on the areas. You

Table 1. Disease scouting results

Farm	Date	Avg number of newly mummified fruits per bush*	Avg number of infected anthracnose clusters per bush*	Avg number of infected Alternaria clusters per bush*
		VAN BUREN COUNTY		
Covert	7/19	0.7	0.0	0.0
	8/2	0.4	1.1	0.0
Grand Junction	7/19	23.5	0.1	0.0
	8/2	12.6	1.8	0.0
		OTTAWA COUNTY		
Holland	7/19	0.9	0.3	0.0
	8/2	0.3	0.7	0.0
West Olive	7/19	96.7	1.1	0.0
	8/2	68.9	1.4	0.0

*Average of 10 bushes.

Fig 1. The fruit epidermis of newly mummified berries has mostly dried, making them easy to see this time of year, 19 July; *Photo: T. Miles.*

Fig 2. Mummy berries on the ground after harvest. Notice the pinkish white color; *Photo: A. Schilder.*

Fig 3. Mummy berry nursery in Grand Junction; *Photo: T. Miles.*

can put some sort of border around the mummies to keep them in place if you think they'd get flooded and float away in the spring; however, it is otherwise not necessary to contain them. Don't use a pan or anything with a bottom as that would change the moisture content of the soil where the mummies are located. The soil should drain naturally. In the spring, you can locate the "nurseries" and monitor mummy berry germination and size of apothecia to help you determine the timing of fungicide sprays.

Anthracnose fruit rot. This week, anthracnose fruit rot was more common at all four sites, with the highest incidence at the Grand Junction site, averaging 1.8 anthracnose-infected clusters per bush. For every visibly infected fruit, there are many more latently infected berries, which can start to rot after harvest. Warm, humid weather is particularly conducive to anthracnose fruit rot. Prolonged fruit wetness (e.g., more than 15 hours) due to dew, rain, or overhead irrigation at temperatures over 70ºF can lead to moderate or high risk of infection. A minimum of 7 hours of wetness is required for infection at the optimum temperature of 79ºF. Fruit rots generally increase with each harvest. Initial symptoms of anthracnose are a softening and shriveling of the fruit, followed by the appearance of small orange dots (spore masses) on the fruit surface (Fig. 4). Fungal spores called conidia are produced in small blisters, which break through the fruit skin (Fig. 5). Berries with high fruit rot levels also tend to have higher microbial counts. Healthy berries can get infected by *Colletotrichum* spores washing down from infected berries in clusters during rain events or overhead irrigation. Infections can even occur by infected berries or spores touching healthy berries on the harvester or sorting line.

Fig 4. Anthracnose fruit rot symptoms in the field observed near Benton Harbor on 2 August 2010; *Photo: T. Miles.*

Fig 5. Closeup of sporulation on rotting berry. Notice the orange spore masses exuding from the open blisters on the fruit surface; *Photo: T. Miles.*

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

How to recognize Phytophthora root rot

Phytophthora root rot in blueberry is usually caused by the oomycete pathogen *Phytophthora cinnamomi*. Oomycetes are fungal-like organisms. They used to be considered fungi but research has shown that they are more closely related to brown algae. This probably explains why they like wet soils and are also called "water molds". Phytophthora root rot is not very common in Michigan but was diagnosed in several locations last year. Heavy rainfall and standing water can contribute to Phytophthora root rot this year as well. Use of weed cloth and black plastic mulch may also increase conditions for this disease. Phytophthora root rot usually occurs at poorly drained sites or low-lying areas.

Early symptoms are yellowing or reddening of leaves and lack of new growth. Below-ground symptoms vary from slight necrosis of young rootlets to extensive necrosis with (partial) reddish-brown discoloration of crowns and main roots. Infected bushes are stunted and may die eventually.The pathogen lives in the soil and produces swimming spores (zoospores) that infect the roots. Abundant soil moisture and temperatures between 20 and 32ºC promote disease development. Thick-walled chlamydospores are the primary overwintering structures and are released into the soil as the roots break down. To diagnose Phytophthora root rot, select roots that are partially diseased, partially healthy and send to MSU Diagnostic Services. A quick test will be done that can diagnose *Phytophthora* in the roots.

If you receive a positive diagnosis for Phytophthora root rot, you can manage the disease by avoiding planting blueberries in poorly drained sites, particularly if the disease has occurred there previously. Also, improve drainage by tiling or grow plants on raised beds. Use effective fungicides, such as Ridomil or phosphorous acids (e.g., ProPhyt or Phostrol). Applications are usually made in the spring and fall when the pathogen is most active. However, if symptoms show up at this time and Phytophthora has been diagnosed, immediate treatment is advised to ameliorate the symptoms. Advanced symptoms will not be cured. Ridomil is applied as a soil drench, but phosphorous acids can be applied both to the foliage and as a soil drench. Research in other crops, e.g., soybean, has shown that applications of calcium (particularly calcium formate) can reduce severity of Phytophthora root rot. This has not been confirmed in blueberries, however.

Fig 6. Reddening/yellowing of leaves due to Phytophthora root rot; *Photo: B. Cline.*

Annemiek Schilder
Department of Plant Pathology
Michigan State University

Insect update

Over the past two weeks, the number of aphid colonies has declined. Aphids were seen at the Grand Junction and Holland farms. Parasitized aphids were observed at all of the scouted farms. Continue to check bushes for aphid colonies, particularly on farms where there are varieties that are susceptible to shoestring virus.

A blueberry maggot fly was caught at the West Olive farm. Growers and scouts should continue to check traps at least once per week through harvest. Replace traps when they become covered with insects and be sure to replace the yellow ammonium charger when the bait runs low. Traps should be temporarily removed from fields during mechanical harvesting, but remember to hang the traps again after the picker finishes. 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.

Fig 7. Blueberry maggot flies were captured in Ottawa County. Note the distinguishing 'W' shaped marking on the wings; *Photo: K. Mason.*

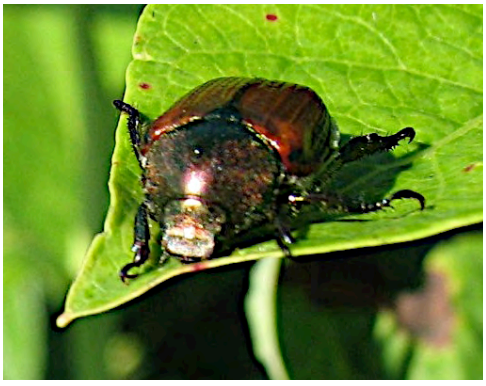

Fig 8. Japanese beetle observed at the Covert farm; *Photo: K. Mason.*

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	7/12	-	-	0	0	2
	7/19	-	-	0	0	0
Grand Junction	7/12	-	-	0	0	0
	7/19	-	-	5	0	0
			OTTAWA COUNTY			
Holland	7/12	-	-	0	0	18
	7/19	-	-	5	0	0
West Olive	7/12	-	-	0	0	0
	7/19	-	-	0	1	0

Japanese beetles numbers have declined sharply over the past two weeks and very little new Japanese beetle feeding damage was observed on leaves and fruit at the monitored farms. Fields should be monitored weekly for the presence of Japanese beetles from now through harvest by examining 10 bushes on the field border and 10 bushes in the field interior and recording 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.

Tussock moth larvae, which can be a pest during harvest was not seen at any of the farms we scouted. Growers and scouts should continue to keep an eye out for this sporadic pest through harvest. See the Blueberry Facts website for more information on this insect.

Keith Mason & Rufus Isaacs
Department of Entomology
Michigan State University

Monitoring and controlling bud mites in highbush blueberry

With harvest ending in some west Michigan blueberry fields, and bushes forming flower buds for the 2011 season, it is time to consider bud mite management for fields that are infested with this pest. The first step is to sample fields that had poor bud development this season, to determine whether treatment for bud mites is required. This article describes identification, sampling approaches, and the available control options.

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

AND 2) high bud mite populations are verified by magnified analysis of bud samples.

This mite is microscopic (Fig. 9A), white or clear, and feeds inside buds in the winter (Fig. 9B), causing damage to developing tissues and resulting in symptoms that include blistered red bud scales in spring, misshapen flowers, small leaves and fruit, or few berries per cluster (Fig. 9C). Berries on infected shoots may also appear roughened and malformed.

The wide variability in symptoms among varieties adds to the difficulty in diagnosing this pest injury. It is important to take shoot samples in the late summer and fall as buds are being set or early spring to identify infestations. Bud mites move to fruit buds formed this year to find places to spend the winter, so fields should be sampled by taking 10 randomly-selected shoots and sampling the top five fruiting buds on each shoot for a total of 50 buds per field. These should be examined to verify that bud mites were the problem with the bushes, because some poor fruiting/growth symptoms are quite similar to the catch-all category of 'winter damage'. Sampling can be done with a hand lens if you know what to look for, or can be done under a microscope by trained personnel. Send samples to your scout, local extension office, crop consultant, or to the MSU diagnostic lab (*www.pestid.msu.edu*) for checking. While there has been no research to develop a specific economic threshold, if 10% of the sampled buds are infested with bud mite, and the field is a susceptible variety, chemical control should be considered.

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

Chemical control options for bud mite. Registered miticide options for blueberry bud mite are limited, but there are effective registered miticides available (Table 1). Endosulfan-containing products such as Thiodan 3 EC, Thionex etc. are the most effective miticides for this pest, and these should be applied immediately post-harvest, with reapplication 2-3 weeks later in heavily infested fields. This will control the mite populations and prevent colonies feeding on buds through the winter. Although the label recommends waiting 6-8 weeks between the sprays, this was developed for southern US conditions, and in Michigan we often do not have that long between the end of harvest and formation of next year's buds. That's why we recommend growers tighten up this period between sprays to get the second Thiodan spray on before complete bud formation. The label recommends that sprays be applied at high pressure (150 to 200 psi) and high gallonage to obtain effective coverage and penetration. Unless the interior spaces of the bud scales are wetted, it is unlikely that good control will be achieved. Use of a surfactant to improve the spreading and penetration of the spray is expected to increase control of bud mites.

Upcoming label changes for Thiodan/ Thionex etc. During 2010, the United States Environmental Protection Agency completed a reassessment of the risks associated with all food-related uses of endosulfan (Thiodan/Thionex etc.). In a July 23 announcement, the agency announced remaining time allowed for use on many crops, including highbush blueberry. Due to the importance of bud mite control in blueberries there is a phase-out period negotiated through July 2015. The new restrictions will not take effect until next year, and there will be a four year phaseout before complete restriction. This is planned to allow time for development and registration of alternatives, and we are already working with the IR-4 program to gain registration of other effective miticides.

Other miticides. Trials of new alternatives to Thiodan including Sulforix have been completed at MSU in recent years. We have also tested some highly-effective new miticides that are not yet registered in blueberry. From our recent trials we expect these to provide control equivalent to endosulfan once they are labelled.

We have found that Sulforix provides moderate control of bud mites when applied in the fall. Many growers are using this for a disease control spray at the end of the season and can expect


9A


9B


9C

Table 3. Miticide rates, timings, and efficacy for blueberry bud mite.

Compound	Rate/ Acre	Application timing	Avg. % control
Thiodan 3EC, Thionex, etc.	2 quarts	post-harvest	93%
Sulforix	1 gal	pre- or post-harvest	60%
Summer oil	1% v/v	delayed dormant (spring)	27%

some level of mite suppression if used at this timing. However, applications timed for leaf drop because of the focus on disease control are later than the ideal timing for bud mite control. By this timing most of the mites will be inside the bud scales and much harder for the spray material to reach.

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

Our pesticide trials at the Trevor Nichols Research station have compared the various options for bud mite control in recent years. Table 1 shows the average level of control (compared to untreated bushes) found in these trials for the main registered options for bud mite control.

Rufus Isaacs, Keith Mason & John Wise
Department of Entomology
Michigan State University

2010-11 Grower Events

JULY 28, 2010 10AM-12PM
2010 Japanese beetle biocontrol field day
We have organized a biocontrol field day for Wednesday, July 28, 2010 at the Michigan State University Tollgate Research and Extension Center in Novi, Michigan. At 10:00, 10:30 and 11:00 AM we will give brief presentations on the Japanese beetle biocontrol program, including instructions on how to transport and release infected beetles. Following each presentation participants will be given a small zip-lock sandwich bag containing infected live Japanese beetles. You are welcome to take them and release them anywhere in Michigan, but Japanese beetle cannot be transported out of the State of Michigan unless you have a permit from USDA-APHIS.

SEPTEMBER 28, 2010 1-4PM
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

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