



Michigan Blueberry IPM Newsletter

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Van Buren County
 Jersey in Covert are at early green fruit; in Grand Junction, Blue-ray are at early green fruit and Bluecrop is at green fruit.

Ottawa County
 Blue-ray in Holland is at petal fall, and Rubel and Bluecrop in West Olive are at early green fruit.

BLUEBERRY NEWS YOU CAN USE...

Disease management: Continue to monitor shoot strikes if blossoms are still open. Begin scouting for shoestring virus symptoms and consider managing aphid populations to prevent the spread of the virus.

Insect management: The petal fall spray is a key spray for fruitworm control. As petal fall ends, fields with a history of fruitworm infestation should be treated with an effective insecticide, and once honeybee colonies are removed, broad-spectrum products can be used.

GROWING DEGREE DAYS From March 1

	2009		Last Year	
	Base 42	Base 50	Base 42	Base 50
Grand Junction, MI				
5/18	820	450	686	366
5/25	964	542	818	450
Projected for 6/1	1054	586	1039	615
West Olive, MI				
5/18	676	348	572	280
5/25	804	425	689	350
Projected for 6/1	900	472	888	492

See [MSU Enviroweather website](#) for more information

Next Twilight IPM Meeting:
Thursday, June 11
 6:00–8:00PM
 Carini Farms
 15039 Port Sheldon Rd.,
 West Olive, MI.
 Contact Carlos Garcia for more information:
 616-994-4580.

Weed Control Meeting & Demonstration:
Thursday, June 18
 6:00–7:30PM
 Getzoff Farm
 7093 116th St.
 Fennville, MI.

INSECT MANAGEMENT

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

Insect activity has continued to increase at all four farms that we sampled. Aphid numbers have increased, the flight of cherry fruitworm is at or past its peak, and cranberry fruitworm is approaching peak flight. Eggs of both fruitworm species were seen during scouting this week.

Aphids were found at all four sampled farms. We are finding 5 to 25% of new shoots have aphids on them. The observed aphid colonies ranged in size from 3 to 15 individuals. As aphid numbers are likely to continue to increase across the region, growers and scouts should continue to check for blueberry aphids on new growth.

To scout for aphids examine two young shoots near the crown on each of 10 bushes and record the number of shoots where aphids are found and also record the number of shoots with parasitized aphids. 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. Although natural enemies (parasitic wasps, lady beetles, lacewings, hover fly larvae) can keep this pest in check, aphids can transmit blueberry shoestring virus, so growers may want to consider using an insecticide to control aphids if they find aphids in fields that are susceptible to shoestring virus.

Fruitworm activity has increased substantially over the past week. Cherry fruitworm moths were caught at all of the farms that were sampled, and cranberry fruitworm was caught at the Covert, Grand Junction and Holland farms. The number of cherry fruitworm moths per trap ranged from 3 to 8, and cranberry fruitworm captures ranged from 6 to 49 moths per trap. More warm nights are expected in the next few days so we should see cranberry fruitworm flight increase over the next week. Cherry fruitworm flight should start to decrease over the next two weeks. All four farms were scouted for the presence of fruitworm eggs. Cherry fruitworm eggs were seen at the Covert

and Grand Junction farms, and cranberry fruitworm eggs were observed at the Covert and Holland farms. Very little fruitworm feeding damage has been seen yet, but a single berry with feeding damage was found at both the Covert and Grand Junction farms.

Follow the link to the [model for fruitworm control](#) to see cranberry fruitworm egg laying predictions based on the MSU Enviroweather weather stations in your area.

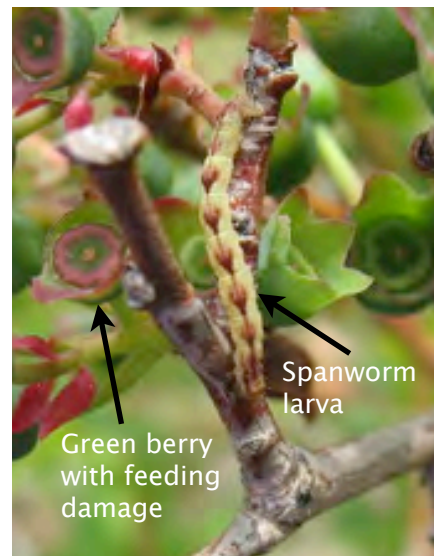


Fig 1. Spanworm larva feeding on green berries.

Leafroller feeding was not observed at any farms, but a spanworm larva was seen at the West Olive farm (Fig. 1). Growers and scouts should continue to look for [leafroller](#) and [spanworm](#) feeding on leaves and in fruit clusters, particularly if insecticides have not been used yet to control fruitworms. Insecticides that are applied for fruitworm management should also control leafrollers and spanworms. This time of the season is also when we expect tussock moth larvae to have hatched from the egg masses. If you had a problem with this pest last year, be sure to look for these small colorful larvae. Insecticides applied for fruitworm control at this time will also be active on larvae of the first generation of tussock moth.

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	5/26	12	23	10%	--	--
	6/1	8	49	10%	--	--
Grand Junction	5/26	7	9	10%	--	--
	6/1	3	39	25%	--	--
Ottawa County						
Holland	5/26	2	4	0%	--	--
	6/1	6/1	6/1	5%	--	--
West Olive	5/26	4	1	5%	--	--
	6/1	3	0	15%	--	--

CFW=cherry fruitworm; CBFW=cranberry fruitworm; BBA=blueberry aphid; BBM=blueberry maggot; JB=Japanese beetle



DISEASE MANAGEMENT

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

Mummy Berry

This week all scouted plots were at or past petal fall. New and old shoot strike infections were found at slightly lower levels than previous weeks, with the highest incidence being observed at the Grand Junction site averaging 56.5 shoot strike infections per bush (Figure 2).



Fig 2. Several shoot strikes at the base of a bush observed near Grand Junction on 5-28-09.

Shoot strikes can be identified by the brown oak leaf pattern along the veins of wilting leaves and a layer of gray powdery spores on the upper part of the leaf and petiole (Figure 3A). When scouting for shoot strikes it is important to be able to distinguish them from other foliar symptoms, such as the oak leaf pattern of blueberry shoestring virus (Figure 3B), and herbicide damage (Figure 3C). This week, continue to monitor shoot strikes if blossoms are still open and consider a fungicide application to protect the flower's stigma.



Fig 3. Foliar symptoms seen near Grand Junction on 5-28-09, A) a shoot strike, B) an infected shoestring virus leaf, and C) a herbicide damaged leaf.

Blueberry Shoestring Virus

Clear symptoms of shoestring virus were noted at the Holland and Grand Junction plots this week. Shoestring virus causes stunting and significant yield reductions, and is spread from plant to plant by the blueberry aphid *Illinoia pepperi*. Fruit that is harvested from an infected bush can show a reddish purple color, which lowers the fruit grade. Some common symptoms for shoestring include: elongated reddish streaks on green stems, especially on the side exposed to the sun and red or purplish, elongated and strap-like leaves (Figure 4). The main control strategy for shoestring virus is to monitor for the aphid vector. If necessary, apply well-timed insecticides to control spread by aphids, starting in late May or early June as the aphid population begins to build up. Furthermore, when planting new fields, use virus-tested stock as a preventative measure. However, if old blueberry-shoestring infected blueberry fields are nearby, the infection can spread over time to the new fields via virus-carrying aphids. It is advisable, where possible, to remove infected blueberry bushes (preferably the entire field) in immediate proximity to new fields to prevent re-infection.



Fig 4. Elongated strap-like leaves are also commonly seen on shoestring infected bushes (observed near Grand Junction on 5-28-09).

Disease Scouting Results

Farm	Date	Avg number of mummy berry shoot strikes per bush*	Avg number of blighted twigs per bush**	Blueberry shoestring virus***
Van Buren County				
Covert	5/21	2.8	--	--
	5/28	2.3	2.1	0/50
Grand Junction	5/21	67.2	--	--
	5/28	56.5	0.8	1/50
Ottawa County				
Holland	5/21	4.3	--	--
	5/28	2.9	0.4	4/50
West Olive	5/21	22.3	--	--
	5/28	19.6	0.4	0/50

*Average number based on 10 bushes.

**Blighted twigs may be caused by various fungi, including *Phomopsis vaccinii*, *Colletotrichum acutatum*, and *Botrytis cinerea*.

***Number of bushes showing blueberry shoestring virus symptoms (50 bushes were scouted).



If blueberries are still in bloom, keep up mummy berry sprays

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

Due to excessive precipitation this spring and difficulty getting equipment into wet fields, growers were not able to put on critical fungicide sprays for control of mummy berry. As a consequence, mummy berry pressure is higher than average in many locations. The number of shoot strikes per bush counted has been over 100 in some cases. In addition to killing shoots that would have been bearing fruit next year, shoot strikes are sources of infectious spores for fruit infection. Good pollinating weather increases the risk of fruit infection, as bees and flies serve as carriers of

infectious spores when they move from infected shoots to susceptible flowers. There is also some new information regarding the possible role of mosquitoes in spreading mummy berry spores; the rainy spring certainly has enhanced the number of mosquitos. The spores germinate on the stigma of the flower and then the fungus grows alongside the pollen tubes through the pistil into the ovaries. Individual flowers are most susceptible right after they open and susceptibility decreases over the next four days (Figure 5). Any flowers that have recently opened are susceptible, even

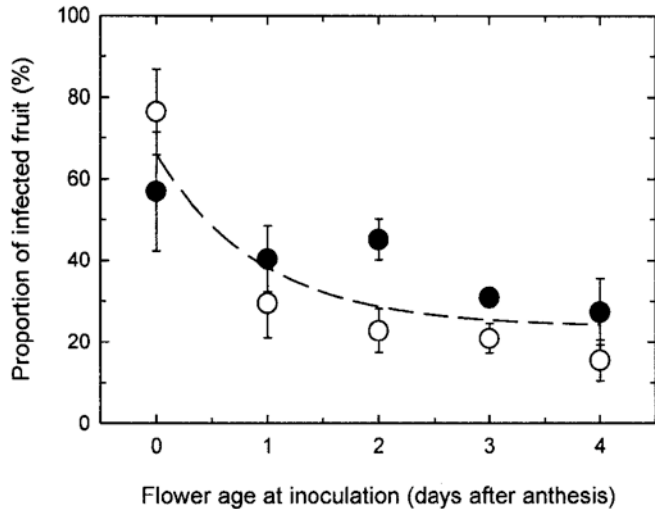


Fig 5. Susceptibility of blueberry flowers to infection by *Monilinia vaccinii-corymbosi*. From: Ngugi, H K., H Scherm, and J S. Lehman. 2002. *Phytopathology* 92:1104–1109.

though the crop is at petal fall. So don't stop applying fungicide sprays. Once the fungus reaches the ovaries, it colonizes the developing berry internally. This infection is not visible

Bloom and early fruit development: A good time to control fruit rots in blueberries

Annemiek Schilder, Department of Plant Pathology, Michigan State University

Fungal fruit rots, especially anthracnose caused by *Colletotrichum acutatum*, continue to be of economic concern in blueberries. Losses can occur before as well as after harvest. The cultivars Jersey, Bluecrop, Rubel, and Blueray are very susceptible to anthracnose fruit rot, whereas Elliott is quite resistant. *Alternaria* fruit rot may be found on Bluecrop fruit before harvest and affects most varieties after harvest (the stem scar of picked blueberries is very susceptible to infection). *Botrytis* fruit rot is not as common in Michigan, but may be a problem in years when cool wet weather prevails during bloom and fruit development. These rots can be distinguished to some extent with the naked eye: anthracnose is characterized by wet, pink to orange spore masses; *Alternaria* fruit rot by a dark green velvety mold, and *Botrytis* by

externally while the fruit is still green but can be seen as white fungal growth if the berries are cut open.

If blueberry bushes are still in bloom, there still is a chance of infection, especially if shoot strike pressure is high in that field or nearby fields. Fungicide sprays to prevent fruit infection are recommended. A systemic fungicide such as Indar will be most effective, since we are trying to specifically protect the flower stigmas from infection. Do keep in mind the pre-harvest interval, which is 30 days for Indar. Indar is also effective against *Phomopsis* twig blight and canker. *Phomopsis* twig blight is showing up too in many locations. However, protection against anthracnose fruit rot is also important at this time, so add a protectant fungicide like Ziram or Captan to the Indar spray. Pristine is also good against the fruit infection stage of mummy berry (though probably not quite as strong as Indar) and has excellent efficacy against anthracnose and *Phomopsis* as well.

fluffy, tan to gray fuzzy mold on the berry surface. See the blueberry website (www.blueberries.msu.edu) for pictures of symptoms.

The anthracnose fungus overwinters in dead fruiting twigs, but has also been found to overwinter in live, dormant buds. The infected buds may die in the spring and support sporulation of the fungus or the opened budscales may sporulate close to the blossom and developing fruit. A twig blight, which is difficult to distinguish from *Phomopsis* twig blight, can also result from bud infection. With anthracnose there are two important periods when the infection risk is high because of peak spore release: from bloom to about pea-size berry (due to overwintering inoculum), and

from first blue fruit until the end of harvest (due to sporulating berries that infect surrounding berries). Fungicide spray programs should focus on these periods. For *Alternaria* fruit rot, aim sprays in the period between pea-size fruit and harvest.

There are several fungicide options for control of blueberry fruit rots. The old stand-by, Captan (captan) is an excellent protectant against anthracnose fruit. Ziram (ziram) has moderate to good activity against most fruit rots. The fungicides Abound (azoxystrobin), Cabrio (pyraclostrobin), Pristine (pyraclostrobin + boscalid), and Switch (cyprodinil and fludioxonil) are also excellent for controlling anthracnose fruit rot. Since Pristine and Switch both have two active ingredients each, they tend to have a broader spectrum of activity than Abound and Cabrio. Switch, for instance, has good to excellent activity against anthracnose, *Alternaria* fruit rot, and *Botrytis*

fruit rot, and would be a great option if you are trying to control multiple fruit rots at once. However, both Pristine and Switch are rather expensive and should be applied during periods when multiple diseases are being controlled to make them cost-effective. The fungicide Elevate (fenhexamid) is primarily a Botryticide with suppressive activity against mummy berry. Captevate (a pre-mix of Elevate and Captan) has efficacy against anthracnose also.

All of the newer fungicides are (locally) systemic and therefore more rainfast than captan and ziram, which are both protectants. Systemic fungicides are better options than protectants during rainy conditions, since they are not washed off readily once dry. Also, if aerial applications are made, systemic fungicides are preferable since they distribute better in the foliage and fruit.



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