

Michigan Blueberry I.P.M. Update



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Contents

- Crop Stages
- Weather Notes
- Pest of the Week – Alternaria Fruit Rot
- Disease Update
- Insect Update
- Post Emergent Herbicides for Blueberries
- High Heat Means Early Insects and Early Harvest Too

The Blueberry IPM Update is a weekly publication produced by Michigan State University Extension. To receive a copy of this newsletter, send an email to masonk@msu.edu. Also available online through blueberries.msu.edu and at: www.isaacslab.ent.msu.edu/blueberryscout/blueberryscout.htm

Editor's Note:

We hope you find the information in this newsletter useful in guiding what to look for as you scout your own farm. The scouting data shown in the Disease and Insect Updates below are taken from four Michigan blueberry farms. As conditions are different from farm to farm, we must stress that the information in this newsletter should not be used as a substitute for scouting your own fields. Your spray decisions should be made based on what is seen on your own farm.

Please use this newsletter to determine when and how to look for certain pests, identify potential pest problems, and to get information on the biology of pests and other aspects of integrated pest management. See the Insect and Disease Updates below for descriptions of some scouting methods that can be used on your farm.

CROP STAGES

Crop stages are similar to last week.

In Van Buren County, Jersey in Covert are at green fruit. Blueray and Bluecrop are at late green fruit in Grand Junction.

In Ottawa County, Blueray are at late green fruit in Holland. Rubel and Bluecrop are both at green fruit in West Olive.

Berries continue to size up well at all our scouting locations, and a hint of color can be seen on many clusters.



Rubel at green fruit in West Olive.

DEGREE DAYS AND WEATHER NOTES

Weather Forecast: A front will move through the area Monday night and Tuesday morning and bring rain and then cooler, less humid weather. Temperatures will be in upper 70's to low 80's this week with a chance of showers or thunderstorms later in the week and over the weekend. By 6-25 GDD₅₀ will increase by ~150, and GDD₄₂ will increase by ~200. Complete weather summaries and forecasts are at available enviroweather.msu.edu

GDD (from March 1)	Base 42	Base 50
Van Buren County		
6-4	1216	744
6-11	1526	846
6-18	1606	1026
Ottawa County		
6-4	1114*	653*
6-11	1243*	742*
6-18	1472*	915*

* enviroweather data for the West Olive station is missing some dates, so data from Hudsonville was substituted for missing values.

PEST OF THE WEEK

Alternaria Fruit Rot

Alternaria tenuissima (fungus)

Timothy Miles and Annemiek Schilder
Department of Plant Pathology, Michigan State University

Alternaria species are an abundant, ubiquitous component in the environment and are a natural part of the fungal microflora. At least 20% of all agricultural spoilage is caused by *Alternaria* species. In a laboratory setting, *alternaria* can be easily identified microscopically by their characteristic club-shaped spore (Figure 1a). *Alternaria tenuissima* is the causal agent of *Alternaria* leaf spot and fruit rot in highbush blueberries. *Alternaria* leaf spot is usually only found in North Carolina (Figure 1b), however, fruit rot has been reported in almost all blueberry growing regions around the world. *Alternaria* fruit rot is primarily a post-harvest disease of blueberry, however, rots can occur in the field when fruit remains on the bush beyond normal ripening.

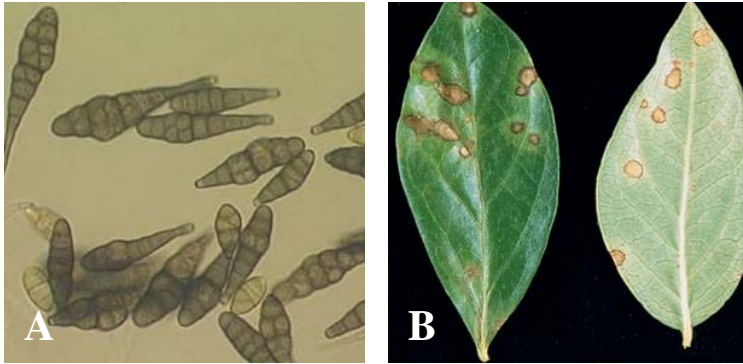


Figure 1. A) Characteristic club-shaped spore of *Alternaria* species (picture from the University of Arizona). B) *Alternaria* leaf spot symptoms (not typically seen in Michigan).

Symptoms

Although not seen in Michigan, *alternaria* leaf spot symptoms will appear in the spring after long periods of cool wet weather. The leaves typically have tan to gray, circular to irregular lesions that are about 1 to 5 millimeters in diameter. These lesions are also usually surrounded by a reddish brown border. In most cases only lower leaves are infected, but a severe infection can defoliate the plant.

In the field, *alternaria* will often appear on ripe fruit, as sunken areas near the calyx are covered by a dark green, velvety growth (Figure 2). Post-harvest, on stored fruit, a grayish-green mold may appear on the stem scar or calyx end and quickly spread over the entire berry. Infected fruit becomes soft and shriveled (Figure 3).

Disease cycle

Alternaria overwinters in infected canes, old twigs and in plant debris on the ground. Studies have also demonstrated that *alternaria* has a variety of alternate host that can serve as a source of inoculum for more fruit infections. In North Carolina, leaf infections occur in the spring during periods of cool, wet weather, and can serve as a vector for fruit infections in the summer. Fruit infections occur as berries start to ripen.



Figure 2. *Alternaria* fruit rot symptoms seen prior to harvest. Notice the dark-green or blackish spores on the sunken lesion.

The optimal temperature for this disease occurs at 68°F (20°C).

Management

Like other fruit rots such as anthracnose, *alternaria* fruit rot does not become apparent until after the first harvest, therefore, preventative measures are necessary to control the disease. A fungicide spray program from pink bud to harvest will prevent infection of blossoms and fruit. The 2007 Fruit Management Guide (E-154 extension bulletin) lists several fungicides that are effective against *alternaria* including Aliette, Pristine, and Switch. Of note if a field has a disease history of *Alternaria*, studies have shown that Switch is an extremely effective control measure for controlling *alternaria* fruit rot.

Cultural control measures are also extremely effective and should be aimed at making the environment less conducive for pathogen growth and development, e.g., by pruning bushes to create an open canopy (this will also allow better spray penetration), good weed control, and timing of overhead irrigation to allow rapid drying of leaves and fruit. Timely harvests and rapid cooling and processing of fruit can reduce post-harvest losses. In the long term, pruning out of old or infected canes and twigs can be effective at eradicating or reducing overwintering inoculum. Another option is to plant resistant cultivars, such as Elliott. Among the newer cultivars, Draper and Aurora are also resistant to *Alternaria* fruit rot.



Figure 3. Post-harvest incubation of fruit under high humidity results in a fuzzy grayish green mold to form on the fruit surface.

DISEASE UPDATE

Timothy Miles and Annemiek Schilder
Department of Plant Pathology, Michigan State University

Immature fruit infections

This week all scouted plots were at a growth stage of late green fruit. Reasonably, scouting for diseases during this time of year is difficult because immature green fruit is relatively resistant to most infections until ripening. However, quiescent or latent infections of the mummy berry fungus are occurring within the immature fruits. Furthermore, other fungi, are presumably sequestered inside of immature green fruits waiting for ripening to occur. Although it is difficult to quantify by detailed scouting, this week we cut open several fruits that appeared to be developing the classic “pumpkin-like” mummy berry symptoms. This researcher found that this technique worked about one-third of the time as insect damage can also contribute to the appearance of ridges along the outside of the fruit. Fruits that showed signs of mummy berry fruit infection had a great deal of white mycelium growing within the fruit, specifically surrounding the ovary (Figure 1). In the coming weeks as fruits begin to color, mummy berry fruit infections will become much more apparent and it will be possible to actively scout them.

Another project of note that we are conducted relates to immature fruit infections. Last week fruit we collected from the field and sterilized and fungi contained with the fruit were allowed to grow on media. Interestingly, very little amounts of anthracnose were found within the fruits (*Colletotrichum*) however, higher amounts of *Alternaria* were observed (Table 1).

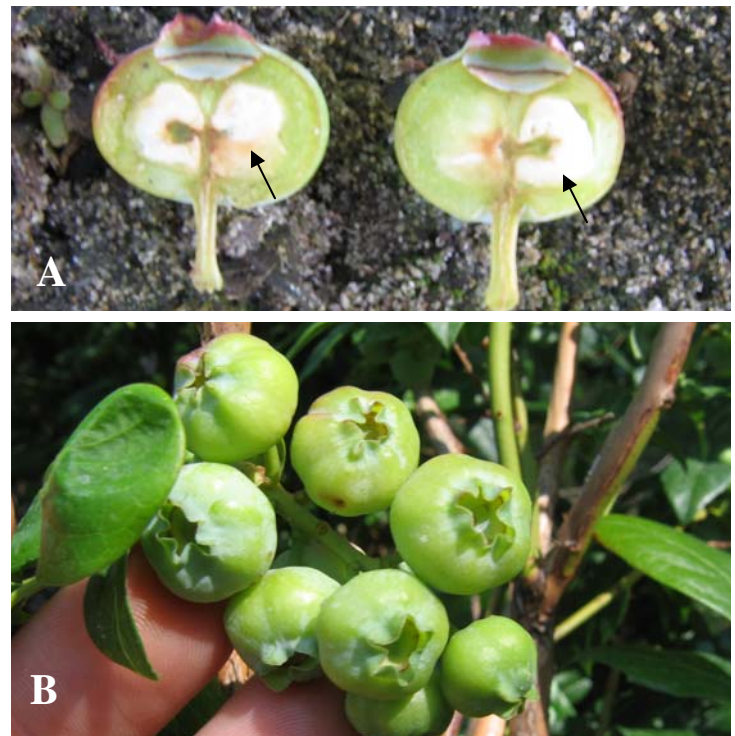


Figure 1. A) White mummy berry mycelium growing through an immature fruit (arrows). B) Immature fruit cluster exhibiting symptoms of mummy berry fruit infections. (Holland, MI).

Fungal genus	Covert	Grand Junction	Holland	West Olive
<i>Alternaria</i>	28.00%	42.00%	26.00%	32.00%
<i>Botrytis</i>	2.00%	2.00%	2.00%	2.00%
<i>Epicocum</i>	10.00%	18.00%	6.00%	4.00%
<i>Pestalotia</i>	0.00%	4.00%	0.00%	0.00%
<i>Colletotrichum</i>	4.00%	8.00%	16.00%	6.00%
<i>Penicillium</i>	2.00%	0.00%	4.00%	0.00%
<i>Monolinia</i>	0.00%	2.00%	2.00%	2.00%
<i>Phomopsis</i>	0.00%	0.00%	0.00%	2.00%
Unknown	2.00%	2.00%	6.00%	0.00%
No Growth	54.00%	24.00%	44.00%	52.00%

Table 1. One week ago (on 6/8/07) green fruits were collected from all scouted plots throughout Western Michigan. Fruit was then surface sterilized in a bleach solution and placed on fungal growth media. The results on the left indicate different species of fungi and their relative percentage on immature fruit.

Table 2. Weekly scouting data, note an increase in *Phomopsis* twig blight symptoms over the past three weeks.

Van Buren County

Farm	Date	Mummy berry shoot strikes per bush	Blighted blossoms per bush *	<i>Phomopsis</i> twig blight per bush	Blueberry shoestring virus **
Covert	6-4	2.7	1.8	2.5	0
	6-11	2.1	0.6	5.5	0
	6-18	-	-	5.6	0
Grand Junction	6-4	13.7	0.3	2.2	0
	6-11	6.0	0	4.6	0
	6-18	-	-	7.5	0

Ottawa County

Holland	6-4	5.8	1.4	3.0	2
	6-11	2.8	1.0	5.8	4
	6-18	-	-	8.4	5
West Olive	6-4	5.2	1.5	5.2	0
	6-11	4.4	2.8	7.8	0
	6-18	-	-	10.2	0

* Blighted blossoms may be symptomatic of mummy berry, *Phomopsis*, *Botrytis* or anthracnose.

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

INSECT UPDATE

FRUITWORMS

Cranberry fruitworm moth flight appears to be past its peak in both Van Buren and Ottawa Counties. A single cherry fruitworm moth was caught in Holland. Cranberry fruitworm eggs were observed in Covert and Holland, but no cherry fruitworm eggs were found. The amount of single berry damage has increased at the Covert, Grand Junction and Holland farms. This damage (example on the right) can be from cherry fruitworm, or it could be early feeding damage from cranberry fruitworm. Live cherry fruitworm larvae were seen at all farms with damaged berries. Low amounts of multiple berry damage, caused by progressing cranberry fruitworm feeding, was seen at Covert, Grand Junction and Holland. In the next week, we expect to see an increase in fruit with signs of fruitworm feeding damage. If either of these insects have been trapped, or if you are seeing damage from these pests on your farm, you will likely need to apply insecticides for fruitworm control. [See the past newsletter page](#) for the 4 June 2007 article on post-bloom fruitworm management for some insecticide options.



Top: Fruitworm entry hole. Note the characteristic darkening of the fruit.
Bottom: Cherry fruitworm larva.

BLUEBERRY APHID

Aphids were detected on all farms except in Covert. The percentage of infested shoots has remained fairly steady, but colony size has increased (5-20 aphids). A parasitized aphid was found at West Olive. You should be scouting your bushes for the presence of this pest (see below for methods). If aphids are found on or near varieties that are susceptible to shoestring virus, the use of insecticides for control may be needed.

TUSSOCK MOTH

No tussock moth larvae were observed. It is likely that sprays targeting fruitworm are controlling this pest.

LEAFROLLERS

No leafroller larvae were observed. Continue to scout your bushes for these larvae and their damage.

BLUEBERRY MAGGOT

No flies were captured. It is likely that rains during this week will trigger the emergence of this pest.

MONITORING FOR FRUITWORMS

After moths are caught and after petal fall (~5-15 or 5-30) bushes should be inspected for eggs and damage each week for a five minute sampling period. Working in a "hotspot," look at as many fruit clusters as possible on 10 to 20 bushes along the field border. Looking at the fruit clusters can help you find eggs in calyx cup, larval entry holes and damage. When inspecting the fruit grasp the cluster and view with the sun over your shoulder. Carefully turn the clusters over and inspect the bottom of the fruit as well as the top for entry holes and/or frass. Record the number of cranberry fruitworm and cherry fruitworm eggs and the number of berries with damage. [Click here for more info and photos of cranberry and cherry fruitworm.](#)

SCOUTING FOR APHIDS

Begin scouting for blueberry aphids in early to mid May. Look at 2 shoots of new growth at the base of 10 bushes and check for the presence of aphids on the underside of the leaves. As the season progresses, you should look for parasitized aphids (mummies). Record the number of shoots with aphids on the 10 bushes – 2 shoots per bush (multiply by 5 to get % infested shoots). Do the same for aphid mummies. For more on blueberry aphids, [follow this link to the aphid section on the blueberry facts website.](#)

Van Buren County						
Farm	Date	CBFW moths per trap	CFW moths per trap	Blueberry aphid % infested shoots	Blueberry maggot per trap	Japanese beetle per 20 bushes
Covert	6-4	13	0	0	trap set	
	6-11	19	0	0	0	
	6-18	0	0	0	0	
Grand Junction	6-4	87	0	10%	trap set	
	6-11	56	0	25%	0	
	6-18	7	0	20%	0	
Ottawa County						
Holland	6-4	37	1	45%	trap set	
	6-11	60	0	30%	0	
	6-18	34	1	30%	0	
West Olive	6-4	0	7	25%	trap set	
	6-11	8	0	15%	0	
	6-18	0	0	25%	0	

POST-EMERGENT HERBICIDES FOR BLUEBERRIES

Eric Hanson, Department of Horticulture, MSU

Several post-emergent herbicides are labeled for use in Michigan blueberries. Most can be useful as spot-treatments to control weeds in problem areas of fields. Each herbicide has different characteristics that need to be considered when making choices.

Aim, Gramoxone, and Rely are burn-down materials. They kill treated plant parts, but do not move within the plant. As a result, perennial weeds are usually not killed because the chemical does not move to the roots. Rely may move slightly in plants, because it often provides a little better control of some herbaceous perennials, such as dandelion. Aim is relatively inexpensive, but does not control grasses. Rely is much more expensive but controls broadleaves and grasses. All three herbicides kill green bark and leaves of blueberries so take care to keep spray off blueberries.

Fusilade and Poast are selective grass killers; they have no effect on broadleaf weeds or blueberries. Application time is critical for control. Grasses must be treated when they are 4-8 inches tall in the spring. If grass is taller, control is poor. These materials are often useful to control quackgrass or annual grasses in young plantings.

Roundup and Touchdown (glyphosate) are the most effective postemergent herbicides for blueberries, but also the most hazardous. These chemicals are absorbed by green tissues and move throughout the plant. Perennial weeds are killed because the chemical moves to below-ground plant parts. Translocation is a two-edged sword. Glyphosate applied to blueberry branches moves within the bush, and can kill large canes or whole bushes. The most effective time to treat perennial weeds is late in the summer because absorbed glyphosate tends to move down to the roots. This timing is also most hazardous for blueberries. Use extreme care to avoid contact with blueberry tissues.

Postemergent blueberry herbicides

Herbicide	Weeds controlled	Pre-harvest interval	Comments
Aim	Annual broadleaves, some perennial broadleaves	1 day	Use a NIS or COC. Treated green stems and leaves will be killed.
Fusilade	Annual and perennial grasses	Non-bearing only	Apply in spring when grass is 4-8 inches tall. Use a NIS or COC. Will not injure blueberries
Gramoxone	Annual grasses and broadleaves		Use a NIS. Treated green stems and leaves will be killed.
Poast	Annual and perennial grasses	30 days	Apply in spring when grass is 4-8 inches tall. Use a NIS or COC. Will not injure blueberries
Rely	Annual grasses and broadleaves	14 days	Treated green stems and leaves will be killed.
Roundup Touchdown	Annual and perennial grasses and broadleaves	14 days	Contact with green bark or leaves may result in cane or bush death.

Rates and costs of postemergent blueberry herbicides

Herbicide	Rate per acre	Approximate cost (\$/treated acre)
Aim	2 oz	11
Fusilade	1 qt	30
Gramoxone	1 qt	9
Poast	1 qt	19
Rely	4 qt	69
Roundup Touchdown	1 qt	9

HIGH HEAT MEANS EARLY INSECTS, AND EARLY HARVEST TOO

Rufus Isaacs, MSU Entomology

This season's heat is moving insect development along very quickly. We have already seen adult false Japanese beetle, *Strigoderma arbicola*, flying around in southwest Michigan near blueberry fields. These are native insects that tend to emerge about a week before the first Japanese beetles. They are not as metallic as the Japanese beetle (*Popillia japonica*), and are slightly smaller. With the continuing high temperatures, expect Japanese beetles to emerge in the next week or so.

The warm spring and early summer has also pushed crop development ahead. We kept track of harvest dates for the four years of our USDA RAMP project conducted in three Van Buren and three Ottawa county Bluecrop fields. The average date of the first harvest for Bluecrop was July 13 and this occurred on average at 1254 GDD base 50 (from March 1). This season we have already reached 1026 GDD base 50 in Grand Junction, and there are about 150 GDD accumulating per week at this site. This would mean reaching 1254 in about 2 weeks from now, putting harvest one to two weeks ahead of last year. Time will tell how well this prediction holds, but it is worth making sure preparations for harvest are underway, especially in any fields of early varieties.

MSU BLUEBERRY TEAM

Horticulture - Eric Hanson
Plant Pathology - Annemiek Schilder
Entomology - Rufus Isaacs
Trevor Nichols Research Station - John Wise
Van Buren Co. - Mark Longstroth
Ottawa Co. - Carlos Garcia
Berrien Co. - Greg Vlaming
Southeast Michigan - Bob Tritten

For more information, see our website at blueberries.msu.edu

