I.P.M. Update

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Contents

The Blueberry IPM Update is a 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

CROP STAGES

In Van Buren County, Jersey in Covert are ready for first harvest. Blueray and Bluecrop in Grand Junction are ready for second harvest.

In Ottawa County, Blueray are undergoing first harvest in Holland. Rubel are within a week of first harvest and Bluecrop is ready for second harvest in West Olive.

Jersey ready for first harvest at Covert.

Editor's Note:

As harvest is well underway, and everyone is increasingly busy, The Michigan Blueberry IPM Update will now be published every other week until the end of harvest. We will notify subscribers via email and on the Michigan Blueberry IPM Update website if any critical issues arise.

The next Newsletter will be sent out August 7th.

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.

DEGREE DAYS AND WEATHER NOTES

Weather Forecast: Dry conditions are expected to continue with a slight chance of showers and thunderstorms beginning Thursday night. High temperatures will be in the mid 80's and lows in the mid 50's to mid 60's. By 7-30 GDD_{50} will increase by ~120, and GDD_{42} will increase by ~210. Complete weather summaries and forecasts are at available enviroweather.msu.edu

GDD (from March 1)	Base 42	Base 50
	Van Buren County	
7-9	2204	1444
7-16	2371	1576
7-23	2505	1671
	Ottawa County	
7-9	2073*	1348*
7-16	2245*	1465*
7-23	2425*	1589*

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

PEST OF THE WEEK

Post harvest issues – fruit rots and microbial contamination

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

Anthracnose - *Colletotrichum acutatum* (fungus)
Alternaria fruit rot – *Alternaria tenuissima* (fungus)
Botrytis fruit rot – *Botrytis cinerea* (fungus)
Microbes (yeasts, molds, and bacteria)

Fruit Rots

The diseases of concern at this time of the year in blueberries are fruit rots, such as anthracnose (gelatinous orange spore masses) and Alternaria fruit rot (green velvety layer of spores) (Fig. 1). Botrytis fruit rot (gray mold) is usually not a problem in Michigan, but can occur, especially in wet years. While fruit rot is usually not visible until the berries ripen, it is prudent to assume you will have a fruit rot problem if you had problems last year. Often, berries look healthy at harvest, but start to rot soon after in the lugs while awaiting processing. Fruit rot levels tend to increase greatly from the first to the last harvest. Fruit rots are favored by high humidity and temperature. Fruit rot symptom development may be slowed down by refrigerated storage, but will resume on the supermarket shelves, lowering fruit quality.

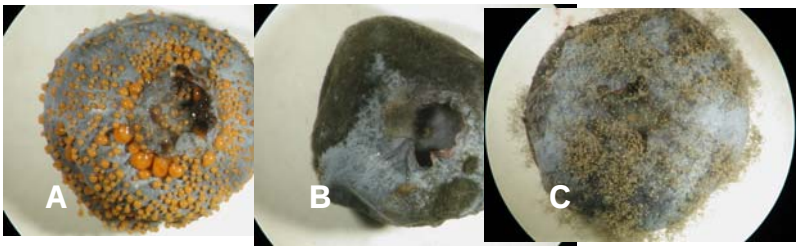

Figure 1. Fruit rotted at 100% humidity for 7 days post harvest. A) Anthracnose 'ripe rot' B) Alternaria fruit rot C) Botrytis fruit rot

Controlling Fruit Rots

If the first blueberries are starting to show rot, fungicide sprays can limit new infections of nearby healthy berries. It is important to take note of the pre-harvest interval (PHI) for the various fungicides. Most fungicides used at this time of the year have a 0-day PHI; however, Topsin-M has a 7-day PHI and Ziram has a 14-day PHI. Fungicide applications on blueberries before the first harvest may provide significant control during subsequent harvests.

The strobilurins (Abound [azoxystrobin], Cabrio [pyraclostrobin], Pristine [pyraclostrobin + boscalid) are all systemic fungicides that are highly effective against anthracnose, 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. Both Switch (cyprodinil + fludioxinil) and Pristine provide good to Elevate (fenhexamid) is primarily controls Botrytis, whereas Captevate (fenhexamid + captan) controls Botrytis as well as anthracnose. In order to test fungicide efficacy against post-harvest fruit rot, treated fruit is harvested and allowed to rot for a period of 7-12 days at 100% humidity (Figure 2) or goes through "simulated commercial handling" (in a clamshell placed at 40ºF for 1 week, then at 70ºF for 3 days) before evaluation.

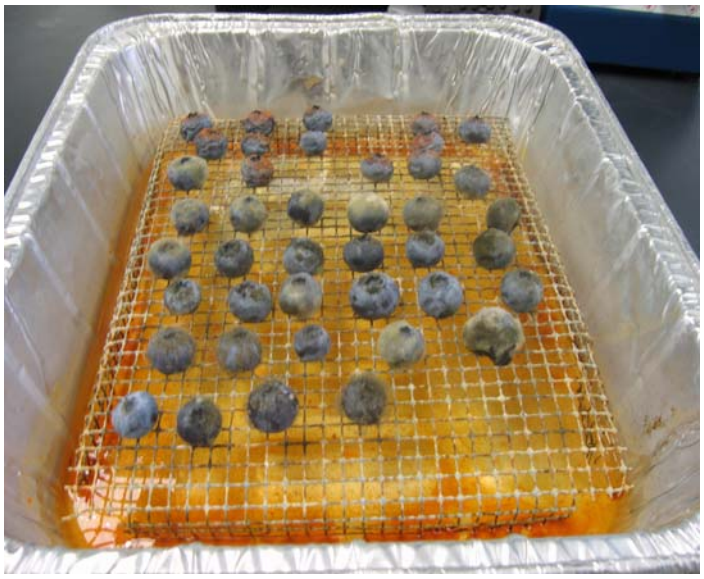

Figure 2. Fungicide efficacy testing at MSU is often done by placing healthy-looking fruit in a pan with 100% humidity an allowing the fruit to rot for a period of 7-12 days (Note - covered with plastic wrap during the test). Fungi are then identified based on their color and appearance.

Microbial contamination

Frozen blueberry fruit for processing may undergo microbial tests mandated by buyers, who want to exclude human pathogens, such as *Escherichia coli* O157:H7, from their products. Coliform bacteria may occur on blueberries and are thought to originate primarily from irrigation with pond water. Standards for the number of such organisms set by buyers vary and are becoming increasingly stringent. Blueberries also contain natural populations of yeasts and molds that live on plant surfaces. These organisms are generally harmless and may even be beneficial as antagonists of fruit rot pathogens. However, high levels of yeasts and molds (fungi) are not desirable because they are thought to affect backing quality of products (e.g., muffins and pies) that are made with such blueberries or could contribute to moldy flavors in other products (e.g., yoghurt). Yeasts and mold counts naturally vary by location. However, high fruit rot levels, appear to contribute to high microbial counts. In fact, *Colletotrichum acutatum* sometimes is the main organism isolated from blueberry fruit surfaces, even if the fruit appears intact and healthy. In general, microbial counts increase over the harvest period, such that later harvests are at higher risk of exceeding microbial standards set by buyers. Methods to reduce microbial counts for blueberries are: 1) having a good fungicide program for fruit rot control prior to harvest, 2) timely harvesting, 3) rapid cooling, 4) timely processing of fruit, especially if it is of poor quality, 5) treatment of processed fruit with chlorine dioxide gas. Irrigation with well water is preferable over pond water.

DISEASE UPDATE

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

This week all scouted plots were around the 1st stage of harvest. In previous issues, we have discussed the difficulties in scouting fruit rots before harvest. This past week, we were finally able to see fruit rot symptoms in the field. Anthracnose fruit rot (orange gelatinous spore masses) was seen in two of the scouted plots, where Alternaria fruit rot (green velvety growth) was seen in all four (Figure 1). Furthermore, we did our final count of mummy berries in our scouted plots as most of them have fallen off of the bush and onto the ground.

Fruit rots in the field

Controlling fruit rots in the field is difficult because of the latent nature of these fruit rot infections. Besides cultural practices like well-timed irrigation and rapid cooling of fruit after harvest, a spray program starting at the green fruit growth stage can be effective in preventing fruit rots. However, even if sprays were not applied in previous weeks, a spray before harvest can provide additional protection against post-harvest fruit rots. Healthy berries that are in close proximity to or in contact with sporulating berries can become infected during rain events before harvest or even after harvest in the harvester and on the sorting line. Scouting for fruit rots in the field can give growers an idea as to whether fungicide sprays are still needed. Effective fungicides against anthracnose fruit rot are Cabrio, Abound, Pristine, and Switch. Alternaria fruit rot is best controlled with Switch or Pristine. The best fungicides against Botrytis fruit rot are Switch, Elevate, and Pristine.

Mummies visible on the ground

Fruit mummies are still visible but many have fallen to the ground. This is a good time to scout for mummified berries, because the whitish outer layer of the newly mummified fruit makes them easier to locate against a dirt background. If there are many weeds on the ground, though, it now becomes harder to find them. Mechanical harvesting may also reduce the numbers seen on the bush. Over the fall and winter, the outer layer will decay and the mummies will become blackish brown in appearance which makes them harder to find.

Figure 1. A) Humidity and berry wetness can contribute significantly towards infection (e.g., at least 12 hours of fruit wetness is required for *Colletotrichum acutatum* to penetrate the berry surface). B) Anthracnose fruit rot symptoms in the field, notice the orange sporulation (arrow) (Grand Junction, MI). C) Alternaria fruit rot symptoms in the field, notice the green velvety growth (arrow) (Covert, MI). These spores can infect nearby healthy berries.

Farm	Date	Mummy berry fruit infections per bush *	Alternaria per bush**	Anthracnose per bush**	Phomopsis twig blight per bush***
Van Buren County					
Covert	7-9	2.0	0	0	7.3
	7-16	5.4	0	0	-
	7-23	4.9	0.3	0	-
Grand Junction	7-9	12.1	0	0	10.6
	7-16	19.1	0	0	-
	7-23	17.7	0.4	0.2	-
Ottawa County					
Holland	7-9	8.2	0	0	9.6
	7-16	16.1	0	0	-
	7-23	13.1	0.2	0.2	-
West Olive	7-9	1.1	0	0	10.4
	7-16	20.0	0	0	-
	7-23	25.0	0.3	0	-

* - Fruit infected with the mummy berry fungus (berries were scouted on the bush and surrounding it).
** - Number of infected clusters showing signs of sporulation (average infected clusters per bush).
*** Phomopsis twig blight was not recorded after 7-9-07 because values generally remained constant throughout the scouted plots.

INSECT UPDATE

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

BLUEBERRY APHID

Aphids were detected at the Grand Junction, Holland and West Olive Farms. The percentage of infested shoots has gone down at most farms and the number of parasitized aphids is increasing. You should be scouting your bushes for aphids. If they are present on or near varieties that are susceptible to shoestring virus, the use of insecticides for control may be needed.

TUSSOCK MOTH

No larvae were observed.

BLUEBERRY MAGGOT

No flies were captured. However emergence has been reported at other sites in Allegan County. Some sites are reporting high captures of this pest. Continue to use traps to monitor this pest throughout the harvest period.

JAPANESE BEETLE

Beetles were observed only at the Covert, Holland and West Olive farms. The number of beetles observed has generally remained steady as growers are using insecticides to control this pest. Some beetle feeding damage has been found on leaves and fruit. Continue to scout for this pest through out the harvest period (see below for methods). For insecticide control options see the newsletter from 6-26-07.

SCOUTING FOR JAPANESE BEETLE

Begin scouting for Japanese beetle in mid to late June. Visually scan the canopy of 10 bushes on the field border and 10 bushes in the interior of the field. Count the number of beetles observed. As beetles are very mobile, check for the presence of feeding damage on leaves and fruit to let you know if beetles have been active in the field recently. See pictures above for examples of fruit and leaf feeding.

Top: Leaf feeding by Japanese beetle.
Bottom: Japanese beetle feeding on fruit.

FRUITWORMS

Cranberry and cherry fruitworm moth flight is over in both Van Buren and Ottawa Counties. No cherry fruitworm moths were caught last week. No fresh cranberry fruitworm or cherry fruitworm eggs were found. Single berries with feeding damage were found only at the Covert and Holland farms and the amount of this damage is lower than last week. Live larvae were observed only at the Holland farm. Clusters with webbing and frass (cranberry fruitworm feeding damage) were found at the Covert, West Olive and Holland farms. In the next week, we expect to see the amount of fruit with fruitworm feeding damage decrease.

		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	7-9	0	0	0	0	0
	7-16	0	0	0	0	5
	7-23	0	0	0	0	3
Grand Junction	7-9	2	0	0	0	0
	7-16	1	0	5%	0	0
	7-23	0	0	5%	0	0
		Ottawa County				
Holland	7-9	0	0	15%	0	11
	7-16	0	0	20%	0	18
	7-23	0	0	5%	0	36
West Olive	7-9	1	0	65%	0	0
	7-16	0	0	85%	0	0
	7-23	0	0	75%	0	1

MONITORING FOR TUSSOCK MOTH TO MINIMIZE HARVEST CONTAMINATION

Rufus Isaacs, Entomology

This article follows up on the more detailed report in our May 30 issue Go to past Michigan Blueberry IPM Newsletters.

Mature tussock moth larva

Tussock moth can cause problems during harvest for blueberry growers, because the larvae can contaminate machine-harvested berries and also because these insects cause skin rashes (tussockitis) on hand pickers who come in contact with their hairs. The second generation larvae should have hatched by now and will be getting bigger during harvest of the later blueberry varieties. Mature tussock moth larvae are large (3-5 cm long) and hairy with distinctive yellow, black, and red coloration.

As harvest approaches, scout fields carefully for tussock moth larvae, especially if they have had problems in previous years. Look inside bushes and under leaves where larvae like to hide. Larvae tend to be most abundant in fields adjacent to deciduous woods, and are usually at higher density near the woods so it will be most useful to spend time scouting in these areas. If larvae are detected close to harvest, select an effective insecticide with an appropriate pre-harvest interval. Because the larvae hide in the bush canopy and the bushes are well developed, aerial applications are likely to be less effective than ground applications. Using a higher volume of water should also help improve penetration of insecticide into the canopy.

Keep a record this year of where you find tussock moth larvae. This will be useful in 2008 when you are planning the management program for your specific fields or sections of fields. Our recent research at MSU has shown that a well-timed and thorough application of an effective insecticide targeting the first generation of tussock moth (around bloom time) can prevent problems with this pest at harvest time.

Consult MSU's E-154 publication, the Fruit Management Guide for current recommendations for insecticides to control Tussock Moth.

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
www.blueberries.msu.edu

MICHIGAN STATE UNIVERSITY EXTENSION

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