M I C H I G A N

Blueberry Newsletter

A newsletter from Michigan State University for the Michigan blueberry industry

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MICHIGAN STATE UNIVERSITY

News you can use

Disease management. Anthracnose fruit rot risk will be high in the coming weeks. Apply a preventative fungicide before a rain period where fruit is expected to be wet for more than 18-24 hours or a systemic fungicide after extended fruit wetness. Continue to monitor for twig blight and canker. Flagging of canes is most likely the result of infections that took place last year.

Insect management. Protect berries from fruitworms. Continue to scout for aphids and scale.

Crop development. In Van Buren County, Jersey in Covert is at early green fruit. Bluecrop and Blueray are at green fruit and increasing in size in Grand Junction. In Ottawa County, Blueray in Holland, and Rubel and Bluecrop in West Olive are at early green fruit.

Green fruit on Bluecrop in Gd. Junction

Bluecrop at early green fruit in West Olive

GROWING DEGREE DAYS — From March 1

	2010		Last Year	
	Base 42	Base 50	Base 42	Base 50
Grand Junction, MI				
5/24	951	529	796	434
5/31	1171	693	942	527
Projected for 6/7	1331	798	1077	611
West Olive, MI				
5/24	821	425	656	336
5/31	1037	584	783	412
Projected for 6/7	1204	695	909	488

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

More blossom and shoot blights

This week, three of the four scouted fields had an increase in the number of blighted blossoms and twigs per bush; however, the incidence per bush still remains relatively low. The highest incidence was observed at the Covert site averaging 6.3 blighted blossoms/twigs per bush. As stated in last week's issue, in Michigan there are five different pathogens capable of causing blossom blight: the mummy berry fungus (*Monilinia vaccinii-corymbosi*), *Phomopsis vaccinii*, *Colletotrichum acutatum*, *Botrytis cinerea*, and the bacterium *Pseudomonas syringae*. Unless signs of the pathogens are evident it is extremely difficult to identify the causal agent of the blight. Because the mummy berry fungus and *Botrytis* often sporulate on host tissue they are the easiest to identify. Botrytis blossom blight was particularly visible at the Holland site, the characteristic fluffy gray/brown sporulation was observed on some of the remaining flower petals (Fig. 1). This sporulation posses a potential risk to developing fruit since *Botrytis* is a postharvest fruit rot pathogen. Also this week, shoot blight was observed at the Covert site (Fig. 2), which most likely was caused by *Phomopsis vaccinii* or *Colletotrichum acutatum* because symptoms included necrotic lesions on the twigs. At this point it may be too late to prevent new infections, but if fields have a lot of twig blight, it may be useful to prevent cane infections through wounds created during mechanical harvesting with fungicides (e.g., Cabrio or Pristine).

Mummy berry shoot strikes still visible, but on the way out

The number of shoot strike infections per bush has decreased slightly compared with previous weeks. However, a significant number of shoot and flower strikes were still observed throughout Southwest Michigan, with the highest number at the West Olive site (Figs. 3 and 4). Notably, all shoot strikes that were seen in the field were at an extremely late stage of infection. Additionally, a site near Covert (not usually scouted for this newsletter) had young bushes that were completely defoliated by mummy berry shoot strikes (Fig. 5). Since blossoms are almost gone there is minimal risk of mummy berry fruit infection.

Anthracnose fruit rot infection risk is increasing

The rainfall that occurred on Memorial Day provided sufficient wetting of fruit (about 17 to 19 hours of wetness duration) to qualify for a low or moderate risk of anthracnose infection in southwest and west-central Michigan. The fungus needs rainsplash for spore dispersal and a layer of water on the

Fig 1. Blighted blossom observed near Holland on 30 May. Note the fluffy gray sporulation on the blossom's petals indicative of *Botrytis cinerea*; *photo: T. Miles.*

Fig 2. Blighted fruit cluster observed near Holland on 30 May. Note the brown discoloration of subtending twig, suggesting *Phomopsis* or anthracnose; *Photo: T. Miles.*

Fig 3. Shoot strike symptoms observed near Covert on 30 May. Note the secondary fungal infections on the decaying leaves; *Photo: T. Miles.*

Fig 4. Mummy berry flower strike symptoms observed near West Olive on 30 May. Note gray discoloration on the flower's stem; *photo: T. Miles*.

dispersal and a layer of water on the fruit for infection. However, once, the spores have been dispersed, they may remain alive for some time until conditions are right for infection. Dew formation at night has not been sufficient for infection most of the time

Fig 5. A young bush completely defoliated by mummy berry shoot strikes observed near Covert on 30 May; *photo: T. Miles*.

because of lower temperatures at night. As the nights have become warmer, dew either does not form as readily or is of shorter duration. When temperatures are in the 70's, 10-12 hours of wetness is sufficient for infection. However, the infection risk increases as fruit stays wet for longer periods, e.g., 18 to 36 hours. A preventative fungicide spray (Cabrio, Abound, Pristine, Switch, Captan, Ziram or Omega) is advised before a rain event occurs. A systemic fungicide (Abound, Cabrio, Pristine, or Switch) applied within 24 (at most 48) hours of an infection period is also effective at stopping incipient infections on green fruit. The most important time to prevent primary anthracnose fruit rot infection is the period from bloom until 3-4 weeks after bloom, since the fungus is most active at this time. The fungus is predicted to reach peak spore release activity with the next rain event in the Grand Junction and South Haven areas. This is based on previous years' experience with spore production related to the cumulative amount of rainfall. If the predictions are correct, a few more inches of rain need to fall in Holland and Benton Harbor to reach peak anthracnose fungus activity.

Table 1. Disease scouting results.

Farm	Date	Avg number of apothecia on the ground*	Avg number of shoot strikes per bush*	Avg number of blighted blossom/ shoots per bush
		VAN BUREN COUNTY		
Covert	5/24	0	1.3	4.9
	5/30	0	1.1	6.3
Grand Junction	5/24	0	35.9	1.6
	5/30	0	7.9	0.8
		OTTAWA COUNTY		
Holland	5/24	0	1.7	0.6
	5/30	0	1.7	1.1
West Olive	5/24	0	67.2	1.6
	5/30	0	64.0	2.2

**Average of 10 bushes.*

Blueberry shoestring virus

Blueberry shoestring is a widespread disease of blueberry, especially in eastern North America, and is caused by the blueberry shoestring virus. Shoestring disease is common in many older Michigan blueberry fields, particularly in 'Jersey' but has also started to spread to 'Elliott'. Shoestring virus is spread from plant to plant by the blueberry aphid (*Illinoia pepperi*).

Symptoms. Common symptoms include: elongated reddish streaks (3 to 20 mm long) on green stems, especially on the side exposed to the sun; and red or purplish, elongated, strap-like leaves. In addition, leaves may become cupped if one side of the leaf fails to develop. Flowers often can become reddish and fruit may be reddish purple instead of blue at during ripening.

Disease cycle. Blueberry shoestring virus is transmitted by the blueberry aphid (Illinoia pepperi). The aphids pick up the virus while feeding on infected plants and then transmit the virus while feeding on healthy plants. Transmission starts in the spring when aphids emerge, and ends in the fall just before leaf drop. Aphids slowly move from infected bushes to neighboring healthy ones as they feed and are also commonly transported down rows by mechanical harvesting equipment.

Management. Destroying infected bushes is recommended but may not be commercially feasible on a large scale. However, old infected 'Jersey' fields should be removed and replaced with new varieties where possible. Spread of the disease may be reduced by controlling the vector, the blueberry aphid. A well-timed insecticide, starting in late May or early June as the aphid population begins to be build up, has been shown to be highly effective. Also washing the harvester between fields to rid the equipment of aphids is recommended. Furthermore, when planting new fields, growers should use virus-tested planting stock as a preventative measure.

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Insect pest activity still increasing

Pest activity at the farms we scouted continues to increase with the favorable weather. Overall cherry fruitworm catches were down from last week suggesting the flight is tapering off. Cranberry fruitworm moths were caught at all farms scouted – in Holland, Covert and Grand Junction. The flight of this pest is increasing and nearing peak levels in southern Van Buren County. Cherry fruitworm eggs were observed at all the scouted farms, but not cranberry fruitworm eggs (though they have been detected at some other high-pressure fields already). Very low levels of early fruitworm feeding damage (much less than 1% of berries damaged) were seen at the Covert and Grand Junction farms (Figure 6). Egglaying by cherry fruitworm should remain steady this week at the farms we monitor in Van Buren and Ottawa counties, and cranberry fruitworm egglaying is predicted to increase this week.

Checking traps and fruit each week will identify fields with pressure from fruitworm pests, and can enable identification of the start (biofix) of the cranberry fruitworm model on enviroweather.msu.edu. This model can be used for predicting optimal spray application dates for controlling cranberry fruitworm. Fields should also be checked for fruitworm feeding damage to determine the level of control in the field and to identify hotspots for future treatments. For more info on these pests, see the fruitworm pages on the blueberries.msu.edu website.

Aphid colonies were seen at all the scouted farms, and we are still getting reports of aphid activity at other farms in southwest Michigan. We have seen the first parasitized aphids of the year at the West Olive farm (Figure 7). Check bushes for aphid colonies (Figure 8), particularly on farms where there are varieties that are susceptible to shoestring virus.

Fig 6. Look out for developing fruitworm damage, seen as early-ripening fruit and/or insect frass; *Photo: R. Isaacs.*

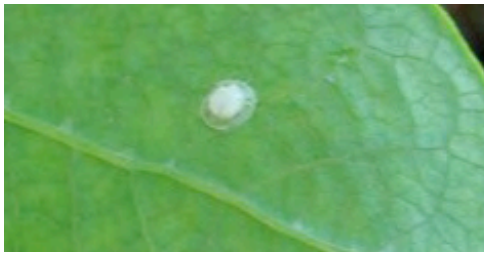

Fig 7. Parasitized aphid; *Photo: K. Mason.*

Fig 8. Aphid colony on the underside of a leaf; *Photo: K. Mason.*

Eastern tent caterpillar larvae, spanworm and leafroller larvae can still be seen in areas that have not been sprayed for fruitworms. Growers and scouts should continue to check fields for feeding damage by these moth pests during the next week. These pests are generally more common in areas bordering woods, but bushes can tolerate some leaf area loss from these insects.

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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	5.24	2	3	5	--	--
	6/1	0	60	5	--	--
Grand Junction	5/24	1	1	5	--	--
	6/1	1	4	25	--	--
			OTTAWA COUNTY			
Holland	5/24	2	0	0	--	--
	6/1	1	14	5/24	--	--
West Olive	5/24	7	0	10	--	--
	6/1	5	0	15	--	--

Fruitworm control options in blueberry

Cherry fruitworm (CFW) and cranberry fruitworm (CBFW) flight is well underway in most areas of Michigan. In the past week, cranberry fruitworm catches have increased and we expect heavy adult flight and egg laying by cranberry fruitworm with the forecasted warm temperatures this week. Protecting berries from fruitworms is critical during this post-bloom stage of the season.

There is an array of insecticides available for control of fruitworms (Table 3), but their performance characteristics are not all the same. It is important to refrain from using compounds that are toxic to bees when these pollinators are in your fields. Two products registered for use during bloom and/or in the presence of pollinators have provided consistent control of fruitworms in trials at the Trevor Nichols Research Complex and at grower fields. These are the *B.t.* products (such as Dipel) and the insect growth regulator Intrepid. These products must be consumed by fruitworm larvae to be effective, so they are best applied over the top of fruitworm eggs so they are eaten as the larvae emerge. *B.t.* products have short residual activity, typically around five days, and are best applied when daily temperatures reach 70°F. Intrepid is more resistant to breakdown, giving between seven and 14 days activity. Other options for control of cranberry fruitworm are the growth regulators Rimon and Esteem. These insecticides are strongly active on eggs and they disrupt the adult moth's ability to lay viable eggs and hinder the development of larvae. As with all fruitworm control applications, excellent coverage of fruit clusters is required.

After 100% petal fall, the range of options for fruitworm control increases, with Guthion, Imidan, Asana, Danitol, Mustang Max, Lannate and Sevin being some of the available broad-spectrum insecticides. For the 2010 season, the restrictions on Guthion allow only up to 1.5 lb per acre to be applied. With all these products, maintaining good coverage is still important to get residue to the parts of the berry where fruitworms are found. Recent research trials in Michigan have demonstrated that Intrepid, Rimon, Avaunt, Assail, and Delegate applied after petal fall can also achieve excellent control of fruitworms, with minimal negative impact on natural enemies such as parasitic wasps, ladybeetles and lacewings. Correct timing and coverage are critically important (Figure 9), so regular scouting of fields, use of sufficient spray volume to get good fruit coverage and selecting appropriate spreader-stickers can increase activity of most insecticides applied for fruitworm control.

Two birds with one stone? Other post-bloom insect pests

At the same time that growers are spraying to control fruitworms, aphid control can be achieved if Assail or Lannate are used. These will need to be applied to the whole bush including the bottom to ensure good aphid control.

High populations of Lecanium scale have been found in regions of west Michigan, especially in the West olive/Holland area. We are monitoring colonies to determine the timing of crawler emergence, but expect that this will coincide with timing of many

Table 3. Insecticide options and timing for fruitworm control in blueberry.

Compound Trade Name	Chemical Class	Life-stage Activity	Optimal Spray Timing	Pollinator/Parasitoid Toxicity Rating
Guthion, Imidan	Organophosphate	eggs, larvae, adults	100% petal fall	Highly toxic
Lannate, Sevin	Carbamate	eggs, larvae, adults	100% petal fall	Highly toxic
Asana, Danitol, Mustang Max	Pyrethroid	eggs, larvae, adults	100% petal fall	Highly toxic
Avaunt	Oxidiazine	larvae	100% petal fall	Highly toxic for bees, otherwise relatively safe
Assail	Neonicotinoid	eggs, larvae	100% petal fall	Moderately toxic
SpinTor, Entrust, Delegate	Spinosyn	larvae	early fruit set OVER eggs	Moderately toxic
Dipel	*B.t.*	larvae	early fruit set OVER eggs	Relatively safe
Intrepid	Growth regulator	larvae	early fruit set OVER eggs	Relatively safe
Rimon	Growth regulator	eggs, larvae	early fruit set UNDER eggs	Moderately toxic
Esteem	Growth regulator	eggs, larvae	early fruit set UNDER eggs	Relatively safe

fruitworm control sprays. Reports of crawler emergence will be reported in this newsletter. We have also observed 10-20% parasitism of scale in fields caused by parasitic wasps. These natural enemies are highly sensitive to some insecticides (see table above), so careful product selection may allow growers to get good fruitworm control while retaining this free scale control.

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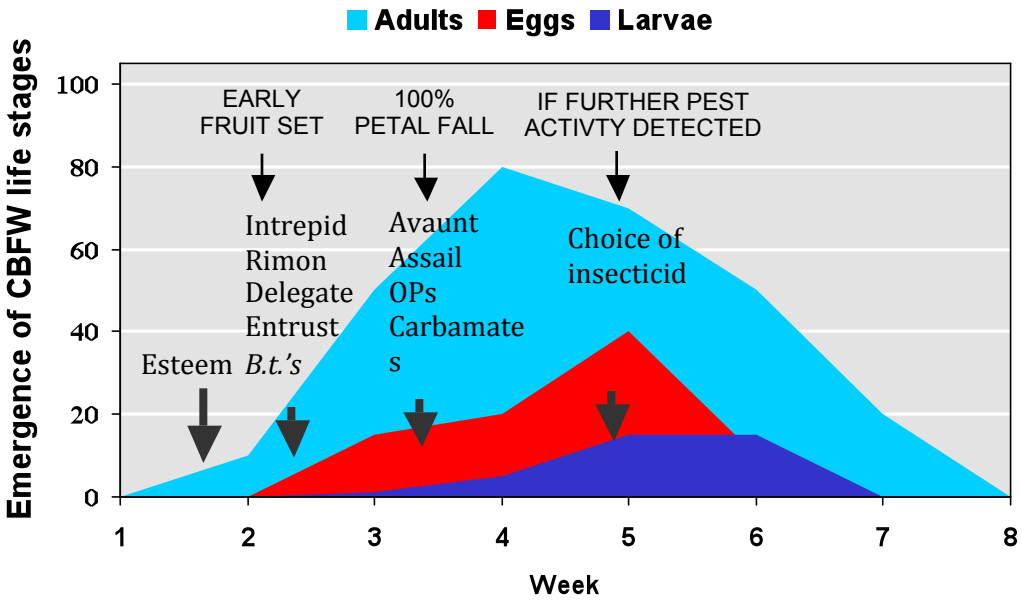
Fig 9. Population emergence of CBFW adults, eggs, and larvae, and the optimal timing to begin sprays of various insecticides.



2010 grower meetings

JUNE 10 **6:00PM**
Pre-harvest meeting - Van Buren County
Location: True Blue Farms
09548 CR 215, South of Grand Junction
Information: Mark Longstroth, 269-330-2790

JUNE 17 **6:00PM**
Pre-harvest meeting - Ottawa County
Location: Carini Farms
15039 Port Sheldon Rd., West Olive
Information: Carlos Garcia, 269-260-0671

JUNE 24 **6:00PM**
Weed Control Demo - Allegan County
Location: Getzoff Farm
7093 116th St., Fennville
Information: Paul Jenkins, 517-648-5099

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