M I C H I G A N

Blueberry Newsletter

A newsletter from Michigan State University for the Michigan blueberry industry

June 8, 2010 Volume 4, Issue 10

Next grower meeting this Thursday, June 10 at 6PM. Location: True Blue Farms in Grand Junction!

MICHIGAN STATE UNIVERSITY

News you can use

Disease management. Twig blight symptoms are apparent; if disease incidence is high, consider applying a fungicide to manage new cane infections later in the season. Also, continue monitoring aphid populations to prevent the spread of blueberry shoestring virus to new plantings.

Insect management. Protect berries from fruitworms. Scout for aphids and scale. Hang blueberry maggot traps soon.

Crop development. In Van Buren County, Jersey in Covert and Bluecrop and Blueray in Grand Junction are showing the first signs of fruit coloring. In Ottawa County, Blueray in Holland, and Rubel and Bluecrop in West Olive are at green fruit.

Fruit coloring on Jersey in Covert

Bluecrop at 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				
5/31	1171	693	942	527
6/7	1336	803	1077	611
Projected for 6/14	1519	931	1214	701
West Olive, MI				
5/31	1037	584	783	412
6/7	1190	683	909	488
Projected for 6/14	1381	818	1050	573

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

Twig blight and canker

Last week, in addition to blighted blossoms there were also blighted twigs and some cankers visible on young canes/shoots (Fig. 1). In addition, flagging of older canes has been noted, which is usually an indication of infections that occurred during the previous growing season. Twig blight symptoms can be readily seen as

Fig 1. A lesion developing into a canker observed near Covert of 30 May. Note the necrosis spreading away from the lesion; necrosis is likely caused by Anthracnose or *Phomopsis*; *Photo: T. Miles.*

sudden wilting of leaves, flower or fruit clusters, accompanied by a (dark) brown lesion advancing down the twig. Most twig blight infections are caused by the fungus *Phomopsis vaccinii*, although other pathogens can also be involved. At this point it may be too late to prevent new twig infections, but if fields have a lot of twig blight it may be an indication of high *Phomopsis* inoculum pressure. It may be useful to prevent infections of newly developing shoots as well as older canes which tend to be infected through wounds created during mechanical harvesting. Control methods include pruning out diseased canes which may be the source of spores for new infections. Preventative applications of fungicides are also useful, such as Ziram, Indar, Orbit, Cabrio or Pristine. Keep in mind that Indar and Orbit have a 30-day PHI, but they can also be used after harvest. In addition, growers can reduce plant wetness by adjusting the timing of overhead irrigation to overlap with natural dew formation.

Fig 2. Shoestring virus symptoms observed near Holland on 30 May. Note dark red/purple oak leaf pattern and the absence of necrosis, indicating this was *not* caused by *Phomopsis*; *Photo: T. Miles.*

Shoestring virus symptoms

Last week, shoestring virus symptoms were clearly visible in many of the scouted plots, particularly at the Holland, Grand Junction, and Covert sites. This disease, which is caused by blueberry shoestring virus (BSSV), can be diagnosed by red streaks on green stems, strap-like, elongated leaves and/or the presence of a dark red (oak leaf) patterns on the leaves (Fig. 2). It is spread by infected planting material and the blueberry aphid *Illinoia pepperi*. It is therefore important to monitor aphids in fields with blueberry shoestring virus to prevent or slow down further spread of the virus, particularly to new fields. If monitoring indicates rapidly growing aphid populations, a well timed-insecticide application may be needed.

Mummy berry fruit infections

Scouting for mummy berry disease (caused by the fungus *Monilinia vaccinii-corymbosi*) during this time of year is difficult because immature blueberries do not show any outward symptoms of infection. Fruit infections in green berries are visible as white discoloration of the ovaries within the green berry only when berries are cut open (Fig. 3). Infections will become outwardly visible as berries start to ripen. Infected berries will turn a tan-brown color and develop shallow ridges. During this time of year there is very little a grower can do about mummy berry infection. In the weeks to come, infected berries will turn whitish purple, shrivel up and fall to the ground, while some will still remain in

Fig 3. Healthy green berries (LEFT) and white mycelium of Monilinia vaccinii corymbosi inovaries of outwardly symptomless green blueberries (RIGHT) observed near West Olive on 18 June 2009; *Photo: T. Miles.*

the clusters. It is the latter ones that may be a problem during harvest as they end up in the lugs. Scouting for the mummified berries will give growers a useful insight into whether this year's treatments were successful and where the inoculum will be located next year for management purposes.

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

Please note: disease scouting will be performed every other week for the remainder of the season.

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.*

Regalia, a new fungicide for organic and conventional

Regalia is a new fungicide for grapes and berry crops (blueberry, raspberry, blackberry, strawberry) with a different mode of action from most other fungicides. It is made with an extract from the plant *Reynoutria sachalinensis* (giant knotweed) which, when sprayed on plants, activates natural plant defenses. This induced diseased resistance is not systemic (i.e., only treated green leaf area is protected), but there is a translaminar effect. This means that when the product is sprayed on the top of a leaf, the bottom of that leaf also is protected. New plant growth is not protected – therefore the product needs to be reapplied on a 7-14-day schedule. The resistance induction takes 1 to 2 days and light is required. Therefore, Regalia should be used as a preventative treatment. The product should be shaken well prior to use as there are solids in the extract. Use a 50-mesh or larger nozzle screen. The addition of a wetting agent is recommended. Regalia can be tank-mixed with other fungicides to enhance control. Regalia can also be alternated with other effective fungicides in an IPM program for fungicide resistance management. The use rate is 0.5-1% (or 2-4 qt in 50-100 gallons of water) when applied alone or 1-4 qt per acre when tank-mixed with other fungicides. Regalia is listed by the Organic Materials Review Institute, which means that it is suitable for organic crop production. In small plot field trials in Michigan, Regalia had moderate to good activity against grape powdery mildew and Botrytis bunch rot in trials with an older formulation. Regalia (applied with Nu-Film-P, a spreader-sticker) provided moderate to good control of mummy berry and fair control of anthracnose in blueberries in 2009 trials. Additional trials are underway. The Regalia label can be viewed on the following website (www.cdms.net) by looking under "Services", then "Labels/MSDS". The price of Regalia is about $15 per quart. The restricted entry interval is 4 hours and the pre-harvest interval is 0 days.

Annemiek Schilder
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Michigan State University

Scouting for fruitworms, aphids, and maggots

Over the past week fruitworm activity at the farms we scouted increased with the favorable weather. Cranberry fruitworm moths were caught at all farms scouted – in West Olive, Holland, Covert and Grand Junction, but cherry fruitworm catches continue to decline, suggesting the flight of this pest is tapering off. Cherry fruitworm eggs were not observed at any of the scouted farms, but cranberry fruitworm eggs were found at the Grand Junction and Covert farms; and cranberry fruitworm eggs were also detected at some other high-pressure fields as well. Low levels of early fruitworm feeding damage (much less than 1% of berries damaged) were seen at the Covert and Grand Junction farms (see Fig. 4). Egglaying by cherry fruitworm should continue to decline at the farms we monitor in Van Buren and Ottawa counties, and cranberry fruitworm egglaying is predicted to increase this week. We expect fruitworm damage will become more apparent in the next week as larvae in fruit cause early ripening of infested berries.

Fields should 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 and check out the cranberry fruitworm model on enviroweather.msu.edu. This model can be used for predicting optimal spray application dates for controlling cranberry fruitworm.

Small aphid colonies (3 to 10 individuals per shoot, see Fig. 5) were seen at the West Olive, Holland and Grand Junction farms, and solitary winged aphids were observed at the Covert farm. We are still getting reports of aphid activity at other farms in southwest Michigan. Parasitized aphids were seen at the West Olive farm (see Fig. 6). Check bushes for aphid colonies, particularly on farms where there are varieties that are susceptible to shoestring virus.

Leafroller larvae and pupae may 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. Leafrollers are generally more common in areas bordering woods. Bushes can tolerate some leaf area loss from these insects, and insecticides used to control fruitworms usually control leafrollers as well.

Growers and scouts should be prepared to hang traps to monitor blueberry maggot fly in the next week to 10 days. For more information on this pest, see the article below on monitoring and management for blueberry maggot or the blueberries.msu.edu website.

Fig 4. Look out for developing fruitworm damage, seen as early-ripening fruit and/or insect frass; *Photo: K. Mason.*

Fig 5. Aphid colony on the underside of a leaf; *Photo: K. Mason.*

Fig 6. Parasitized aphid; *Photo: K. Mason.*

Keith Mason & Rufus Isaacs
Department of Entomology
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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	6/1	0	60	5	--	--
	6/7	1	57	15	--	--
Grand Junction	6/1	1	4	25	--	--
	6/7	0	17	15	--	--
			OTTAWA COUNTY			
Holland	6/1	1	14	5	--	--
	6/7	1	6	5	--	--
West Olive	6/1	5	0	15	--	--
	6/7	2	2	15	--	--

Fig 7. Blueberry maggot with distinctive wing pattern; *Photo: R. Isaacs.*

Monitoring & management strategies for blueberry maggot

Rufus Isaacs[1] and John Wise[1,2]

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[2] Trevor Nichols Research Station, Michigan State University

The blueberry maggot goes through one generation per year, over-wintering as a pupa below the soil surface. Most pupae emerge one year after going into the soil, though depending on climatic conditions a small proportion will remain as pupae through another year or two before emerging. Adult emergence typically begins in mid to late June with adult flight continuing through August. First adult emergence can be predicted by using a Growing Degree Day (GDD) model, because adult fly emergence should begin at 750 DD base 50. Actual emergence can be delayed if the soils are dry, as pupae usually respond more readily to a moist environment. Thus, initial adult emergence often follows a rainfall event in late June and in July. After emergence, female flies require approximately 7-10 days to become sexually mature and mate, at which point they will begin laying eggs. Eggs are oviposited under the skin of ripening blueberries, with a single egg deposited per fruit. Eggs hatch in about 5 days, at which point the maggot begins feeding, completing their development within a single berry. Upon maturity, the maggot drops to the ground, burrowing up to several inches into the soil before pupating. In Michigan's climate, these pupae will not emerge until at least the following growing season.

Monitoring adult blueberry maggot flight is the foundation of an effective protection program for blueberries against this pest. Initial adult emergence is best monitored using yellow sticky boards baited with ammonium acetate (or ammonium carbonate) as a food attractant, because newly emerged females are actively feeding during this pre-oviposition period. These traps should be placed on a stake or hung on an upper branch of a blueberry bush in a perimeter row (south facing side of bushes) with enough foliage cleared from around the trap so leaves don't stick to it. Hang traps with the colored side down in a V-orientation (see photo). Traps should be deployed before first anticipated flight (late June), since most flies are expected to be immigrating from wild or non-sprayed hosts outside the commercial planting. If a resident fly population is suspected from previous infestation, a trap placed inside the field is a good idea to detect internal infestations. Traps optimally should be checked twice weekly starting at 700 GDD base 50 until the first fly is caught, triggering fruit protection activities.

After the pre-oviposition period is complete, female flies will begin actively searching for fruit to lay eggs in, and there is a trap available that mimics the visual stimulus of a fruit. A green sphere trap, baited with synthetic fruit volatile lure can be used to monitor fly activity in fields. Again, these traps should be placed in perimeter rows of the field unless there is evidence of a resident population far in the interior.

Control of blueberry maggot has been achieved for many years using broad spectrum insecticides. These kill the adult fly on contact and prevent the insect surviving to the point of being able to lay eggs into the fruit. The organophosphates Guthion, Malathion and Imidan are highly active on blueberry maggot, with the latter two products having shorter pre-harvest intervals and potential for use closer to harvest. Carbamates such as Sevin and Lannate and the pyrethroids Asana, Mustang Max, and Danitol are also active on adult fruit flies. As a general rule, our trials in fruit crops against maggot flies have shown lower activity from the pyrethroid chemical class than from the organophosphates.

Continued next page.

Fig 8. Maggot on ripe blueberry; *Photo: R. Isaacs.*

There are several newer insecticide products that include blueberry maggot on their labels. These include the neonicotinoids Provado and Assail that are also active on Japanese beetle and aphids. Small plot trials of these products have shown that they protect fruit from maggot infestation, and in large-scale trials over four years in Michigan blueberry farms we found no blueberry maggot infestation in fields treated with Provado during July and early August. The spinosyn-containing compounds Delegate, SpinTor (non-organic formulation) and Entrust (organic formulation) are highly active on blueberry maggot adults when ingested. In field trials with high pest pressure and two week application intervals their performance has been rated as good (see table). Performance would be expected to be higher in fields with lower pressure and with less time between applications.

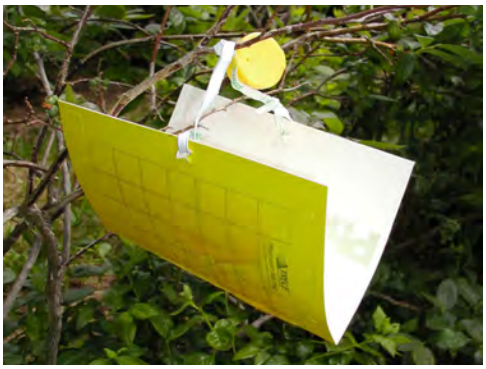

Fig 9. Blueberry maggot monitoring trap with V-orientation; *Photo: R. Isaacs.*

Table 3. Products and their effectiveness against blueberry maggot.

Trade Name	Chemical Class	Optimal spray timing for BBM	Residual activity	Effectiveness rating**
Guthion, Imidan	organophosphate	within 7 days of first fly capture	14+ days	excellent
Malathion	organophosphate	within 7 days of first fly capture	5-7 days	good
Lannat, Sevin	carbamate	within 7 days of first fly capture	5-7 days	good
Asana, Danitol, Mustang Max	pyrethroid	within 7 days of first fly capture	7-10 days	good
Delegate, Entrust*, SpinTor GF120NF*	spinosyn	immediately after first fly capture	7-10 days	fair to good
Provado, Assail	neonicotinoid	within 7 days of first fly capture	10-14 days	good to excellent
Surround WP*	particle film protectant	multiple applications BEFORE fly emergence	as long as thorough coverage of canopy is maintained	good

* OMRI approved for organic production.
** Effectiveness rating of insecticides, 2010 Michigan Fruit Management Guide.

GF-120 NF Fruit Fly Bait (spinosad) is registered for control of the blueberry maggot and is listed by the Organic Materials Review Institute (OMRI) for use in organic production. Because the primary route of entry into the insect is through ingestion, applying this product during the fruit fly pre-oviposition period is important for optimal performance. GF120 must be applied with specialized equipment, and is designed for low-volume application by air. Field efficacy data is encouraging, but it is sensitive to wash-off. We have limited experience with this novel formulation in large-scale trials in Michigan.

The use of SURROUND WP for fruit fly control is based on creating a protective barrier between the plant and the pest that 1) reduces host recognition of the pest, and 2) prevents adult oviposition (i.e.; egg laying). Because it is not toxic to adult flies like conventional insecticides, complete coverage of the plant is critical. Multiple applications are typically needed to attain initial coverage; further sprays may be necessary to respond to wash-off from rain or excessive wind. Field trials indicate that when adequate coverage is maintained that excellent fruit protection can be achieved, although the white residue makes this not suitable for fruit destined for the fresh market.

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, 616-260-0671

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

MICHIGAN STATE UNIVERSITY EXTENSION

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