April 21, 2009 Volume 3, Issue 2

Michigan Blueberry IPM Newsletter

MICHIGAN STATE UNIVERSITY EXTENSION

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Van Buren County
Jersey in Covert, and both Blueray and Bluecrop in Grand Junction are at late bud swell/green tip.

Ottawa County
Blueray in Holland, and both Rubel and Bluecrop in West Olive are at bud swell.

BLUEBERRY NEWS YOU CAN USE...

Weed management. April is an important time to apply pre-emergent herbicides.

Disease management. Growers should scout for mummy berry and consider fungicide treatment if leaf buds are at green tip and apothecia (trumpets) are found.

Insect management. Check buds for early season insect pests (leafrollers, cutworm, spanworm and flower beetles); these may become active over the next week. Contaminant moth has been captured in cherry fruitworm traps.

Meetings. Note date change for May!

Wednesday, May 13 (6-8PM), Cornerstone Ag, 01240 57th St., Grand Junction, MI.

Thursday, June 11 (6-8PM), Carini Farms, 15039 Port Sheldon Rd., West Olive, MI.

GROWING DEGREE DAYS

From March 1

	2009		Last Year	
	Base 42	Base 50	Base 42	Base 50
Grand Junction, MI				
4/13	177	65	116	41
4/20	236	95	215	99
Projected for 4/27	315	143	353	188
West Olive, MI				
4/13	112	32	83	25
4/20	165	58	172	73
Projected for 4/27	238	96	286	141

See MSU Enviroweather website for more information

MSU Blueberry IPM

WEED MANAGEMENT

Eric Hanson, Department of Horticulture, Michigan State University

2009 Herbicide update for blueberry

April is an important time to apply preemergent herbicides on blueberries. If the right herbicides and rates are selected (and mother nature cooperates), annual weeds can be controlled through the harvest period. The traditional herbicides include Princep, Karmex, Sinbar, and Solicam. Rates and use instructions for these materials are outlined in the MSU Extension Bulletin E-154, Fruit Management Guide. Here are two newer herbicides that may be useful in blueberry weed control programs.

CALLISTO provides preemergent and postemergent control of several broadleaf weeds that are troublesome in blueberries, including several pigweed species, chickweeds, horsenettle, lambsquarters, marestail, eastern black nightshade, ragweed, and smartweed. Callisto has limited effect on grasses. Callisto is absorbed by weeds through the roots and leaves. Apply Callisto before bloom at up to 6 fl. oz. per acre. This amount may be split into two 3 oz. applications at least 14 days apart. Apply as a directed spray to soil beneath the bushes. The addition of crop oil concentrate (COC) will improve postemergent activity, but combinations with postemergent herbicides such as Gramoxone or Rely are suggested for very weedy areas. Callisto with COC may injure blueberry leaves and young stems. Callisto can be used on young, non-bearing and bearing bushes. Avoid plant contact as much as possible.

CHATEAU is primarily a preemergent, soil-active herbicide. Chateau has some postemergent activity when it is applied with a non-ionic surfactant or COC, but it is more effective as a burndown in combination with postemergent herbicides such as Aim, Rely, Gramoxone, or Roundup. Troublesome blueberry weeds controlled by Chateau include chickweeds, dandelion, common groundsel, lambsquarters, eastern black nightshade, several pigweeds, ragweed, and most annual grasses. Application rates are 6 to 12 oz product per treated acre. Do not apply Chateau after bud break through final harvest. Do not mow treated areas between bud break and final harvest, because dust created by mowing may settle on blueberry leaves and cause injury. Do apply to bushes that have been in the field less than 2 years. Rain or irrigation is needed to activate Chateau.

Callisto and Chateau have different weed spectrums from the commonly used preemergent herbicides such as Princep, Karmex, and Sinbar. They also have different modes of action, so it should be helpful to rotate these products over time to broaden the weed control spectrum. Another important value of these new herbicides is they may discourage development of herbicide resistant weed populations. Weed populations can develop resistance if herbicides with the same mode of action are used too much. Weeds that are resistant to one herbicide are also resistant to other herbicides with the same mode of action. Alternating or combining herbicides with different modes of action will help prevent resistance. Blueberry preemergent herbicides and their modes of action are summarized in **Table 1** (page 3). Price estimates for preemergent herbicides are summarized in **Table 2** (page 3). Actual prices may vary by source, but this should give an estimate of relative costs per acre of treated ground.

Table 1. Common modes of action of preemergent blueberry herbicides.

Herbicide	Mode of action
Karmex, Princep, Sinbar, Velpar	Inhibit photosystem II
Casoron	Inhibit cellulose synthesis (cell walls)
Solicam	Disrupt carotinoid synthesis (pigments)
Surflan	Inhibit microtubules (cell division)
Devrinol	Inhibit VLCFA's (cell division)
Callisto	HPPD inhibitor (pigments)
Chateau	PPO inhibitor (disrupts membranes)

Table 2. Preemergent hercide for blueberries, rates and estimated costs.

Product	Common name	Rates (product/acre)	Price/unit[1]	$/treated acre[2]
Callisto 4L	mesotrione	6 fl oz	$630/gal	$30
Casoron 4G	dichlobenil	100–150 lb	$2/lb	$200–300
Chateau SW	flumioxazin	6–12 oz	$104/lb	$39–78
Devrinol 50DF	napropamide	8 lb	$12/lb	$96
Gallery 75DF	isoxaben	0.7–1.3 lb	$150/lb	$105–195
Karmex 80DF	diuron	2–4 lb	$6/lb	$12–24
Kerb 50WP	pronamide	2–4 lb	$45/lb	$90–180
Princep 90DF	simazine	2.2–4.4 lb	$5/lb	$11–22
Sinbar 80WP	terbacil	1–2 lb	$40/lb	$40–80
Solicam 80DF	norflurazon	2.5–5 lb	$22/lb	$55–110
Surflan 4AS	oryzalin	2–4 qt	$56/gal	$28–56
Velpar 2L	hexazinone	2–4 qt	$74/gal	$37–74

[1]Costs approximated from dealer quotes (January 2009), and will vary with source.
[2]Product costs for treating an acre of ground. If band-applying under blueberry rows so half the ground surface is treated, costs would be half of those listed.

INSECT MANAGEMENT

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

Insect activity has been low at all four farms, but with the forecasted weather at the end of this week, we could see some leafroller, climbing cutworm or spanworm feeding in the next week or ten days. Another early season pest, the flower feeding beetle Hoplia trifasciatus may also emerge in the next week. This beetle is most common in areas with sandy soil. For more information on this pest, please see the May 15, 2007 issue of the Michigan Blueberry IPM Update Newsletter.

As the warm weather promotes bud development, scout fields for bud damage by spanworm, cutworms and other spring larvae. The damage is usually more obvious than the insect larvae, and it may be seen as complete bud removal or ragged feeding on the buds. A working threshold for control at this point in the season is 2% of the buds removed. Count 10 buds on 10 bushes spread through the field to pick up any hot-spots.

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	4/13	set				
	4/20	0				
Grand Junction	4/13	set				
	4/20	0				
			Ottawa County			
Holland	4/13	set				
	4/20	0				
West Olive	4/13	set				
	4/20	0				

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

Cherry fruitworm traps were set on 4-13-09, and as of 4-20-09 no cherry fruitworm have been caught. We do not expect the flight for this pest to begin in the next week. Growers and scouts should set traps for cherry fruitworm and cranberry fruitworm in the next couple of weeks and the traps should be checked twice weekly until the moths are caught and then traps should be checked once a week until first harvest.

We have started to catch a moth in cherry fruitworm traps that is **not** cherry fruitworm. This "contaminant" moth is Pseudexentra vaccinii and is commonly caught in cherry fruitworm traps. Although it reportedly may feed on blueberry; we have never found it to be a pest of any economic consequence in Michigan. The contaminant moth is ~½ inch long which is much larger than cherry fruitworm which is ~¼ inch long. Cherry fruitworm also have an iridescent banding pattern while the contaminant moth has darker markings on a light gray body. See the photos to the left to help with identification.

Fig. 1 Cherry fruit worm (left) and the 'contaminant moth' found in cherry fruitworm traps (right).

DISEASE MANAGEMENT

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

Mummy berry

Now is the time of year to begin scouting for mummy berry. Mummy berry is a serious disease of highbush blueberries in Michigan and is prevalent in most blueberry-growing regions throughout the United States. The disease can kill young vegetative shoots, reducing next year's yield potential. In addition, infected berries are not edible and there is a zero tolerance for mummified berries in harvested fruit. Mummified berries fall off the bush and overwinter on the ground. They germinate in spring to form apothecia. Previous research has shown that the optimum temperature for formation of apothecia and infection is 50 to 57°F (10 to 14°C). Extended wet periods and frost promote infection. Furthermore, the presence of succulent green leaf tissue is also a basic requirement for primary infection, resulting in mummy berry shoot strikes. Therefore, if blueberries are at or past green tip and are actively expanding they will be particularly susceptible to infection.

Fig 2. Mummy berry apothecia seen near Nunica, MI on 4-14.

Mummy berry apothecia were observed by us as early as 4-14-09 in Nunica, MI (Figure 1). This week all scouted plots contained at least some apothecia. The number of mummies on the ground varied between each scouted plot. The percentage of germinated mummies was as high as 15.8% in the Holland site, which is somewhat lower than previous years. All apothecia scouted had cups 2 mm in diameter or smaller. As the cups continue to expand, apothecia will begin to release ascospores, which will lead to infection of newly developing leaf tissue. Growers should scout for mummy berry and consider fungicide treatment if leaf buds

Disease Scouting Results

Farm	Date	Avg number of mummies on the ground*	% Germinated mummies	Avg number of apothecia on the ground*	Max apothecia cup diameter (mm)
		Van Buren County			
Covert	4/20	0.7	14.3	0.1	2.0
	4/27				
Grand Junction	4/20	16.2	9.3	1.5	2.0
	4/27				
		Ottawa County			
Holland	4/20	1.9	15.8	0.3	2.0
	4/27				
West Olive	4/20	4.0	0.3	0.1	1.0
	4/27				

*Average number based on 10 bushes.

New additions to the 2009 disease update

This year we will be including data from our experimental site in Nunica, MI, in subsequent additions of the Disease Update. This experiment is aimed at investigating the relationship of apothecial density and size and environmental conditions to mummy berry ascospore concentrations in the air. These experiments will use a Burkard spore trap for spore counts, and a Watchdog Weather station for environmental data (Figure 3).

Fig 3. A) Burkard Spore trap. B) Watchdog weather station monitoring soil moisture, soil and air temperature, and relative humidity.

Virus survey planned in Michigan blueberry fields for 2009

Virus diseases of plants are systemic, and once plants are infected, they cannot be cured. Virus symptoms include plant stunting, leaf and flower malformation, reduced yield, progressive decline and even plant death. Viruses spread via a range of mechanisms, including insect and nematode vectors, cuttings, etc. The main control method is prevention, especially via the use of clean planting material. Virus-free certification programs are credited with lowering the incidence of virus diseases in blueberry fields nationwide. It is especially important that we keep new viruses like blueberry scorch virus out of our production region.

However, symptoms of virus diseases are not uncommon in Michigan blueberry fields. Mostly, these are of known viruses such as blueberry shoestring virus and tomato ringspot virus, but sometimes other symptoms appear that don't seem to fit specific descriptions. Last year, plants with purple blossom symptoms and plant decline were noticed in some blueberry fields in SW Michigan. In summer, leaf scorching, defoliation, and plant decline were seen in other locations. No viruses other than the ubiquitous blueberry shoestring virus were detected in these samples, which suggests that more sleuthing is necessary. It is also possible that some of these symptoms are due to new viruses or that they are due to herbicide injury. Some of the newer herbicides have growth regulator properties and all the manifestations of injury caused by these herbicides may not yet be known. However, a spotty distribution and a progressive decline of affected plants may be indicative of a virus disease.

To improve our diagnosis of virus and virus-like diseases and assess disease occurrence in Michigan blueberry fields, a field survey will be conducted in 2009. We also plan to evaluate a new DNA detection method for blueberry stunt phytoplasma, which would allow us to have a fast and sensitive method at hand for confirmation of blueberry stunt disease. We will invite blueberry growers to send leaf samples of blueberry bushes with suspicious virus-like symptoms. Testing will be free. There will be several dates during the growing season when we will conduct large-scale serological testing of blueberry leaf samples. Advance notice of these dates will be given through the CAT Alert, Blueberry IPM Update and at grower meetings so that samples can be submitted on or before those dates. We will also arrange field visits to take plant samples. To sign up or for more information, contact Jerri Gillett at gillett@msu.edu or Annemiek Schilder at schilder@msu.edu. You can also reach us by phone at 517-355-7539 or contact your local extension agent.

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BLUEBERRY INSECT SCOUTING PROTOCOLS

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

Aphids. Begin scouting ~ 15 May. Look at 2 shoots of new growth at the base of 10 bushes and check for 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.

Cranberry and Cherry fruit worm. CBFW and CFW traps (For each species, use one Large Plastic Delta Trap (LPD) w/ the appropriate sex pheromone lure pinned to the inside of the roof of the trap). Attach the trap to the outer canopy of the upper third of a blueberry bush on the field border. Traps should be hung adjacent to woods in "hot spots" where damage has been noted in the past. Set traps at least 30ft apart in mid to late April. Check traps weekly, record the number of moths caught. Remove moths from the sticky trap insert. Replace sticky insert as needed.
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. Look at fruit clusters for 1) eggs in calyx cup of fruit 2) larvae entry holes 3) frass on berry 4) entry hole on fruit. 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 record the number of incidences of single berry or multiple berry damage.

Appearance of fruitworm eggs and damage.			
	Egg	**Entry into berry**	**Damage**
Cranberry fruitworm	Cream-colored to green ovate eggs in calyx cup	Bottom entry hole	Multiple berry webbing or damage (adjacent berries)
Cherry fruitworm	Transparent, flat egg on calyx cup	Top entry hole	Single berry damage

Japanese Beetles. Sampling begins when beetles emerge ~1 July. Record the total of JB on each of 10 bushes from the field border and 10 interior bushes. To sample a border bush begin on one side of the bush and move around while visually scanning the canopy. Avoid bumping the bush during counting as beetles will drop or fly off. To sample interior bushes, scan the halves of two bushes that face the row middle you are walking in to avoid disturbing the beetles by walking between bushes. Try to sample from as large an area of the field as possible.

Blueberry maggot..Use one yellow sticky trap w/ ammonium super charger. Hang trap on the outer canopy of the upper third of a blueberry bush on the field border. Set trap ~ 1 June. Check trap weekly, record the number of flies caught and remove captured flies. Each week check that the ammonium supercharger is at least half full, and change as needed. Traps may also need to be changed every 2 to 4 weeks if many other insects are caught.

Other Pests. While scouting bushes for the pests listed above, record incidence of other pests or damage such as: Leafroller larvae, tussuck moth, blueberry spanworm (inchworm) damage, blueberry blossom weevil, European snout beetle, blueberry flea beetle damage, blueberry tip borer damage and scale insects.

BLUEBERRY DISEASE SCOUTING PROTOCOLS

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

Anthracnose fruit rot (pre-harvest, during harvest). To scout for anthracnose fruit rot pick 10 random bushes spread out in 2 different rows (5 per row), sample ten clusters per bush and record the number of clusters with visible signs of sporulation. Anthracnose fruit rot manifests itself as sunken areas on ripe fruit with gelatinous, orange spore masses.

Alternaria fruit rot: (pre-harvest and during harvest). To scout for Alternaria fruit rot pick 10 random bushes spread out in a 2 different rows (5 per row), sample ten clusters per bush and record the number of clusters with visible signs of sporulation. On the bush Alternaria appears on ripe fruit as sunken areas near the calyx that are covered by a dark green, velvety growth.

Mummy berry (see table). Mummy berry is a complex disease with both primary and secondary infection events causing different disease symptoms. To scout for mummy berry, pick 10 random bushes spread out in 2 different rows (5 per row) and record the number of mummy berry symptoms. Depending on the time of year, scout in the appropriate location to monitor symptom development throughout the season (table below).

Scouting for mummy berry		
Symptom	Where to scout?	When to scout?
Mummified berries (pseudosclerotia)	On the ground	Budswell to bloom
Trumpets (apothecia)	One the ground	Budswell to bloom
Shoot strikes	Leaves on the bush	Late green tip to petal fall
Newly mummified fruits	Fruit on the bush & ground	Fruit coloring to 75% ripe

Phomopsis twig blight and canker (bloom to fruit coloring). To scout for Phomopsis twig blight and canker pick 10 random bushes spread out in a 2 different rows (5 per row), and record recent browning and death of young twigs and collapsing flower/fruit clusters. Twig lesions may originate from infected buds which subsequently die. For cankers, look for brown areas on young green canes and sunken areas on lower parts of older canes. Wilting/dying canes ("flagging") in summer may indicate presence of a canker lower down the stem.

Shoestring virus (bloom to green fruit). To scout for bushes infected with shoestring virus pick two rows within a field and look for common symptoms of shoestring virus, which 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. Scouting for shoestring virus should only be done once per season because disease incidence will not change drastically within one growing season.

Other diseases (all season): While scouting bushes for the diseases listed above, record incidence of other diseases such as: Botrytis blight, powdery mildew, leaf rust, virus symptoms, stunt, etc.