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.** Continue scouting fields for virus and other disease symptoms. Bring samples to the upcoming grower meeting for free disease diagnosis. Protect developing fruit from infection by fruit rot pathogens.

**Insect management**. More reports of scale, have you checked your fields? Blueberry maggot traps should be out.

**Crop development**. In Van Buren County, Jersey in Covert, and Bluecrop and Blueray in Grand Junction are at late green fruit with some early signs of fruit coloring. In Ottawa County, Blueray in Holland, and Rubel and Bluecrop in West Olive are at late green fruit with some early signs of fruit coloring.

**Blueberry IPM grower meeting this Thursday**. There has been a location change for this week's grower meeting. Here are the details:

**Date:** Thursday, June 17

**Time:** 6:00PM

**Location:** Port Sheldon Township Hall, 16201 Port Sheldon St., West Olive (1.5 miles west of Carini Farms).

Fruit coloring on Bluecrop in Gd Junction

Early coloring on Blueray in Holland

## GROWING DEGREE DAYS

From March 1

| | 2010 | | Last Year | |
|---|---|---|---|---|
| | Base 42 | Base 50 | Base 42 | Base 50 |
| **Grand Junction, MI** | | | | |
| 6/7 | 1336 | 803 | 1077 | 611 |
| 6/14 | 1513 | 924 | 1214 | 701 |
| Projected for 6/21 | 1717 | 1073 | 1409 | 840 |
| **West Olive, MI** | | | | |
| 6/7 | 1190 | 683 | 909 | 488 |
| 6/14 | 1354 | 792 | 1050 | 573 |
| Projected for 6/21 | 1565 | 947 | 1241 | 708 |

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

# Mummy berry

At our scouted plots the majority of shoot strikes have decayed (Figure 1). However, fruit infected by the mummy berry fungus (*Monilinia vaccinii-corymbosi*) were detected in two of the four scouted plots. Some infected berries were showing slight indentations at the calyx end (Figure 2), but it was not clear whether this was caused by mummy berry infection or caused by something else. When blueberry fruits are immature it is difficult to determine whether a fruit is infected by the mummy berry fungus. Initially, an infected developing berry has no external symptoms. However, if infected green fruit are cut open, white, cottony mycelium can be seen in the ovaries of the berry. As berries mature, some infections will become outwardly visible, because infected berries turn a tan-brown color and develop shallow ridges. As we approach ripening, infected berries will turn tan brown then whitish purple, shrivel up and fall to the ground, while some will still remain in the clusters. At this time there is very little a grower can do about mummy berry fruit infection. However, scouting for the mummified berries will give growers useful insights into whether this year's treatments were successful and where the inoculum will be located next year for management purposes.

**Fig 1.** Shoot strike symptoms observed near West Olive on 14 June; *Photo: T. Miles.*

**Table 1. Disease scouting results.**

| Farm | Date | Avg number of shoot strikes per bush* | Avg number of blighted blossom/ shoots per bush | Mummy berry fruit infections present? |
|---|---|---|---|---|
| | | *VAN BUREN COUNTY* | | |
| Covert | 5/30 | 1.1 | 6.3 | no |
| | 6/14 | 0 | 6.9 | no |
| Grand Junction | 5/30 | 7.9 | 0.8 | no |
| | 6/14 | 0.3 | 1.3 | yes |
| | | *OTTAWA COUNTY* | | |
| Holland | 5/30 | 1.7 | 1.1 | no |
| | 6/14 | 0 | 2.0 | no |
| West Olive | 5/30 | 64.0 | 2.2 | no |
| | 6/14 | 6.5 | 2.0 | yes |

**Average of 10 bushes.*

## Scouting for mummy berry fruit infections

To scout for mummy berry infected fruit rot, pick ten random bushes spread out in a 2 different rows (5 per row). Sample ten random clusters per bush and cut at least one berry per cluster open and look for the starburst white pattern on the internal fruit surface. Record the number of berries that are infected.

## Twig blight

This week a similar number of blighted twigs were observed in the scouted plots compared to last week. However, the blighting appeared to be more advanced with necrotic areas appearing larger and more blighting of leaves and fruit clusters per lesion (Figure 3). The




**Fig 2.** Scouting for mummy berry infected fruit near West Olive on 14 June. A) Suspicious fruit, B) Cutting fruit open, and C) Observation of cottony white mycelium in the developing fruit;

**Fig 3.** Blighted fruit cluster observed near West Olive on 14 June; *Photo: T. Miles.*

highest number of blighted twigs per bush was observed at the Covert site, averaging 6.9 blighted twigs per bush. At this point it is likely too late to prevent new twig infections, but it may be useful to prevent cane infections through wounds created during mechanical harvesting with fungicides. In addition, growers can time overhead irrigation to overlap with natural dew formation so as to reduce the number of hours that plant tissues stay wet.

## Scouting for twig blight

To scout for twig blight pick ten random bushes spread out in a 2 different rows (5 per row). Twig blight symptoms can be readily seen as brown to black lesions on green twigs or tip dieback. Another typical symptom of twig blight that can occur throughout the season is sudden wilting of leaves and blighting of flower or fruit clusters. Record the number of twigs with recent browning and death as well as collapsing flower/fruit clusters.

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## Update on 2010 Statewide survey for blueberry scorch and shock diseases

The 2010 statewide survey by the Michigan Department of Agriculture (MDA) for blueberry shock and blueberry scorch diseases is currently ongoing. Blueberry shock and blueberry scorch are caused by specific plant viruses, which are detrimental to blueberry plants but are not harmful to people. The MDA is randomly testing plants by leaf sampling on Michigan blueberry farms of growers who sign up for the survey. Plants do not have to be symptomatic. However, if plants are showing suspicious symptoms, e.g., sudden death of blossoms or young shoots on isolated plants, they will be preferentially sampled. Up to now, more than 8,000 samples have been tested out of a total of 35,000 samples planned. Testing is free and on a voluntary basis.

Unfortunately, the first two weeks of sampling revealed three separate sites testing positive for **blueberry scorch**, including a location where the disease was found last year. This suggests that some spread may have taken place by aphids (positive farms should follow a good aphid control program). In addition, it appears that scorch is not confined to the "Legacy" variety as we had hoped was the case in 2009. The virus has also been found in "Hannah's Choice". Follow-up at the positive sites is on-going and survey crews will continue to move forward with the survey as planned. Blueberry shock virus, the virus that was found at the Trevor Nichols Research Complex last year and subsequently eradicated from the site, has not been detected anywhere at this point. Blueberry shock virus is pollen-transmitted.

**Fig 4.** Sudden blighting of leaves on a blueberry bush (cv. Rubel) due to blueberry shock virus. Sever mummy berry shoot strike may appear similar but tends to affect multiple bushes of a susceptible variety (eg. Blueray), whereas blueberry shock virus may affect scattered bushes throughout the field and may be flanked by perfectly healthy bushes; *Photo: A. Schilder.*

**Fig 5.** Blighted blueberry flowers due to blueberry scorch virus. Finding scattered or isolated blueberry bushes with symptoms is characteristic for viruses. If a majority of bushes have symptoms, it is most likely Phomopsis or Botrytis blossom blight; *Photo: P. Oudemans.*

Growers should not be fearful of participating in the survey, as we do not expect these viruses to be widespread and most of the time the samples will be negative. Some people might take the attitude that ignorance is bliss, but no grower should want to have either of these viruses on their farm as they can spread and cause widespread damage on the farm as well as put the entire blueberry industry in Michigan at risk. Since blueberry scorch is aphid transmitted (relatively short-distance), if any removal is recommended, it would likely be limited to affected rows with follow-up monitoring in subsequent years.

If you become aware of fields with symptomatic plants or want a general screen of fields on your farm, please contact MDA as follows to assure the farm is included in the survey. Growers in Berrien, Van Buren and Allegan counties can contact Crew Leader Becky Madsen at (517) 599-6716 or Regional Supervisor Mike Hansen at (269) 429-0669. Growers in Ottawa, Muskegon, Oceana, Mason or Kent counties can contact Regional Supervisor Jeff Zimmer at (616) 866-1486. Growers in other parts of the state should contact Abigail Eaton at (517) 241-3933. Please note that the survey is being extended through July 16, 2010 (it was previously scheduled to be completed by June 25, 2010).

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# Facts about Phomopsis in blueberries

*Phomopsis vaccinii* is a fungus that causes twig blight and cane canker on blueberries. *Phomopsis* thrives during cool, rainy periods. We have seen twig blight this year in blueberries but levels have been low to moderate. Blueberry plants are most susceptible to Phomopsis twig blight infection during bloom. Infections of older canes occur soon after mechanical harvesting which causes wounding of canes. Infections of newly emerging canes can occur throughout the growing season, but are most common during rainy periods in mid- to late summer and into the fall. *Phomopsis vaccinii* can also infect fruit and cause soft and split fruit; however, this problem is more common in southern growing areas. In Michigan, *P. vaccinii* occasionally causes post-harvest fruit rot, usually in fields with a lot of Phomopsis twig blight. Some facts about *Phomopsis*:

1. The fungus overwinters in infected plant parts, particularly canes and twigs. Old canes and twigs may be a source of spores for several years. Phomopsis can also overwinter in live buds and can cause twig blight infections by killing the bud and then advancing into the twig.
2. The pathogen is usually introduced in a field on the planting material (dead twigs and small brown lesions may be visible on a few young plants) and then the disease builds up over time.
3. Cultivars Jersey, Berkeley and Duke are most susceptible to infection.
4. Reproductive structures (pycnidia) are tiny and pear shaped (visible as brown to black pimples in infected plant parts) and produce tiny spores that are exuded in gelatinous masses and dispersed by rain splash and irrigation water.
5. Pycnidia are only produced in the bleached/gray areas on infected canes and twigs.
6. Spore dispersal is local (usually within 3 feet from the source, maybe a bit further in case of wind-driven rain)
7. *Phomopsis* can be active throughout the growing season; however, most spores are released in spring and early summer, which is an important time for disease control, particularly for twig blight.
8. Most of the spores come from twigs and canes infected during the previous growing season(s); i.e. new infections usually do not contribute significantly to spore production during the current growing season.
9. Rain is important for spore production, dispersal, and infection. Long wetness durations (24-48 hours) and cool to moderate temperatures (59-75ºF) are ideal for infection.
10. Cold weather may slow down growth of young tissues and increase drying time if wet, therefore prolonging the susceptible period.
11. Young, succulent plant tissues are most susceptible to infection. Frost injury can predispose young tissues to infection. Infections may not be visible for 2-3 weeks after infection.
12. Older canes cannot become infected unless they are wounded, e.g., by harvesters bending and cracking canes or scraping the bark off the canes. Infections may not be noticed until the cane collapses the following summer.
13. In severe cases, *Phomopsis* may infect the crown of the plant, leading to repeated infections of new shoots developing from the base. This can be confirmed by cutting canes and looking for necrosis of the wood below the soil line. In this case, it would be better to remove the infection portion of the crown or entire bushes.
14. Herbicide (mis)use may also predispose the plants to infection, either by weakening the canes or by directly damaging the canes, providing entry points for the fungus.
15. Plant stress (cold winters, drought stress, waterlogging) may hasten death of infected and weakened canes, leading to widespread flagging and collapse of older canes during early to mid-summer.

Control of Phomopsis is best accomplished by a combination of sanitation (removal and destruction of diseased plant parts) and use of effective fungicides. Do not underestimate the importance of selective pruning (removing and destroying diseased and dying canes in addition to removing older, non-productive canes), even though this is labor intensive. After a serious disease outbreak, it may take several years of pruning and fungicide use to regain control, so be patient. In severe cases, all canes should be mowed off and destroyed (either by burning or burying) and new canes protected from infection. Avoiding overhead irrigation or minimizing leaf wetness duration by timing overhead irrigation to coincide with natural dew periods and to speed drying will also help suppress Phomopsis. Weed control to reduce tall weeds and pruning to maintain an open canopy will also help reduce relative humidity. Reduce plant stress by ensuring proper drainage and irrigation to avoid waterlogging and drought stress, respectively. In addition, do not over-apply nitrogen to avoid late flushes of growth and highly succulent tissues which are susceptible to frost injury and infection by Phomopsis.

Buying healthy plants from reputable nursery will help reduce disease establishment in blueberry fields. Blueberry nurseries should therefore pay particular attention to control of *Phomopsis* in young plants in the nursery and utilize a preventative spray program so as to reduce disease transmission to production fields. Check planting material before planting and remove diseased twigs/canes.

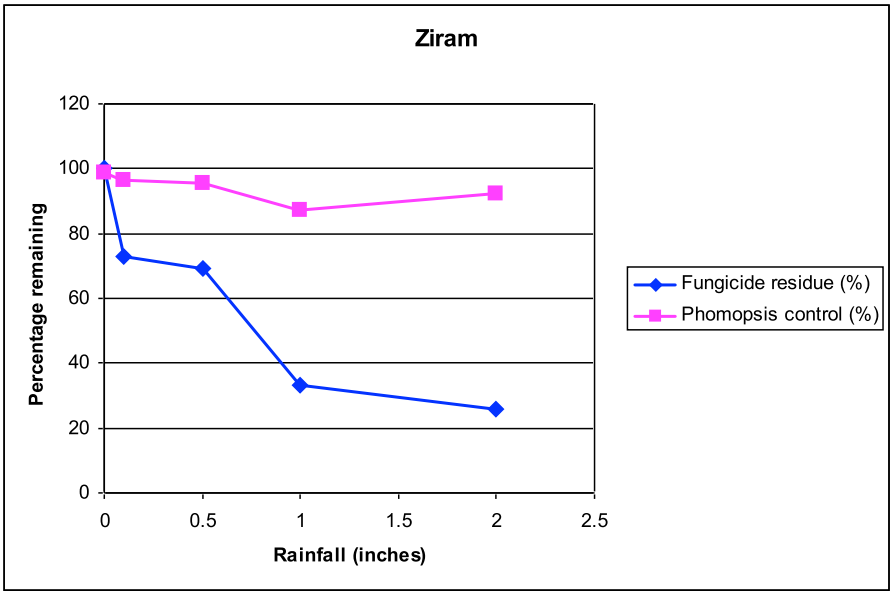
If you are not sure what disease you have, it is a good idea to have a diagnosis done first (e.g., by MSU Diagnostic Services (http://www.pestid.msu.edu/ or phone: 517-355-4536), as twig blight and canker symptoms can be caused by multiple pathogens (although *Phomopsis vaccinii* is the most common cause in Michigan). However, if the pathogen turns out to be bacterial or viral, fungicides won't be effective. For Phomopsis twig blight and canker, Bravo, Ziram, and Captan are good protectant fungicides. Serenade + Nu-Film-P and Regalia + Nu-Film-P are options for control in organic fields. However, more trials have to be done to assess their efficacy. All protectant fungicides have to be applied before infection to stop spore germination and infection. Systemic fungicides for Phomopsis control are: Indar, Orbit, Pristine, Cabrio, and Aliette. Thorough spray coverage is very important for disease control. Adjust nozzles to aim the spray into the base of the bush when spraying to protect newly emerging canes. Also take the pre-harvest interval into account when applying fungicides closer to harvest. For instance, Indar and Orbit have a 30-day pre-harvest interval. These fungicides can be applied again after harvest, however. Dormant sprays of lime sulfur, liquid sulfur (e.g., Sulfur 6L) or copper (e.g., Cuprofix), may aid in reducing the amount of overwintering inoculum but should not be a stand-alone method of disease control. Fall sprays may be important for control of infections of late-emerging canes and new buds, but further research is needed to confirm this.

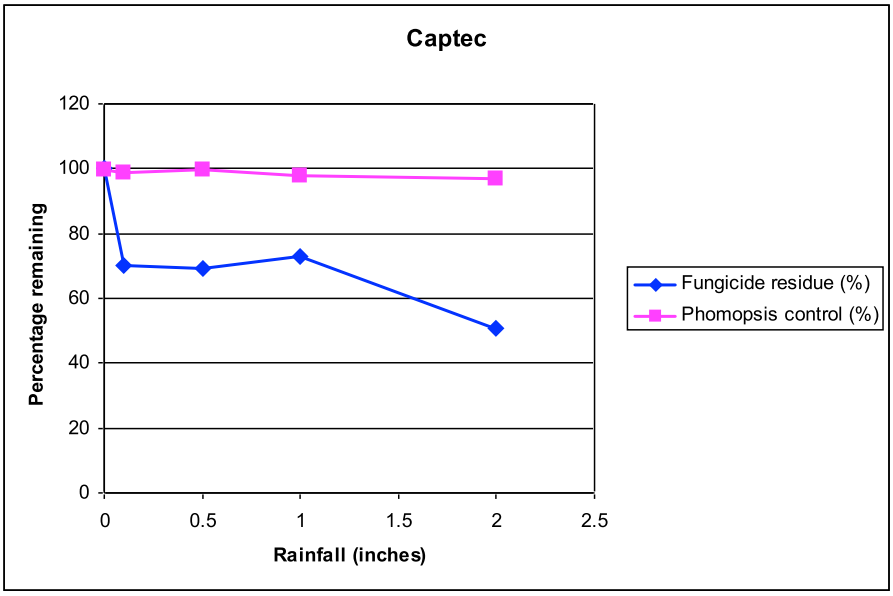
## Fungicide properties and weather conditions

Fungicides can be divided into two groups: **protectant** and **systemic** fungicides. Protectant fungicides are contact materials that remain on the outside of the plant surface and kill fungal spores and hyphae upon contact, thereby preventing infection from occurring. Systemic fungicides are absorbed by the plant cuticle and underlying tissues and can act by killing spores and hyphae as well as incipient infections where the fungus has penetrated the plant surface. When they stop infections and prevent symptoms from developing they are called "curative". However, symptoms that are already present will not be "cured" by the fungicide in question. After symptoms appear, some fungicides can reduce or inhibit fungal sporulation: these are called "anti-sporulants". The term "eradicant" is often used for products like lime sulfur which kills overwintering fungal structures in woody plant tissues when applied as a dormant spray. However, eradicants seldom eliminate all overwintering inoculum. Occasionally people use the term "eradicant" for very effective fungicides that prevent current season infections to the point that the disease appears to have been eradicated. The term "translaminar" refers to the movement of a fungicide from one side of the leaf to the other, providing disease control on both sides of the leaf.

| Protectant/ contact | Systemic |
|---|---|
| Actinovate | Abound |
| Bravo | Aliette |
| Captan | Cabrio |
| Copper | CaptEvate (mixture) |
| JMS Stylet Oil | Elevate |
| Kaligreen/ Armicarb | Indar |
| Lime sulfur/ Sulforix | Orbit |
| Omega | Phostrol/ProPhyt |
| Oxidate | Pristine |
| Prev-Am | Regalia |
| Serenade | Ridomil Gold |
| Sonata | Switch |
| Sporan | |
| Sulfur | |
| Ziram | |

Systemic fungicides are systemic to different degrees, with some fungicides being locally systemic (they move only a short distance away from the spray droplet, e.g., Elevate), others being more



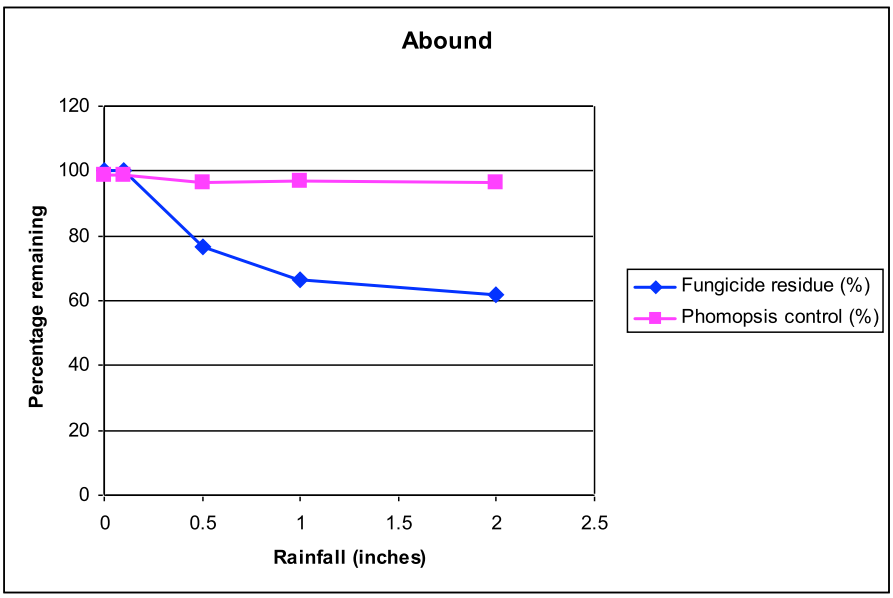




***Fig. 6. Results of fungicide rainfastness study in grapes with the fungus Phomopsis viticola.*** *Fungicide residues were 1-day old when simulated rainfall was applied.*

mobile in the plant (systemic) and able to move to the tip of the leaf or shoot (Orbit, Abound), and yet others being highly systemic and able to move throughout the plant including the roots (e.g., ProPhyt, Aliette). Most systemic fungicides are highly effective against their target pathogens regardless if they are locally systemic or systemic. However, products that are fully systemic tend to have longer post-infection activity because they penetrate deeper into the plant tissues and are able to catch more advanced infections. In the latter case, the higher the rate used, the better the post-infection activity.

Both protectant and systemic fungicides are effective when applied before infection occurs, but only systemic fungicides have efficacy after the fungus has penetrated the plant (for a limited time, e.g., 24 to 72 hours, depending on the fungicide, disease, and rate used). Since systemic fungicides are absorbed by plant tissues and get redistributed in the plant, they tend to be less susceptible to wash-off by rain compared to protectant fungicides which remain on the outside of the plant. A general rule of thumb that is often used is that 1 inch of rain removes about 50% of the protectant fungicide residue and over 2 inches or rain will remove most of the spray residue. However, newer "sticky" formulations (e.g., Bravo Weather Stik) and fungicides applied with spreader-stickers may be more resistant to wash-off by rain. Also, fungicides and formulations differ a lot in their ability to adhere to plant surfaces. Therefore research is needed to describe the effect of rainfall on wash-off on specific products.

In addition, protectant fungicide residues naturally decrease over time due to weathering, such as degradation by sunlight (UV radiation), heat or microbial activity, and redistribution over the plant surface by rainfall, dew, or irrigation water. Growing tissues will also add to the fungicide dilution effect. In contrast, the concentration of systemic fungicides is reduced mainly

due to redistribution and dilution in (growing) plant tissues as well as possible breakdown by the plant itself. A high pH of water used in the spray tank can result in alkaline hydrolysis (breakdown) of some fungicides, notably Captan. Most protectant fungicides are good for about 7-14 days of protection, and systemic fungicides for 7-21 days depending on the product, the rate applied, weather conditions, and disease pressure

Recent research at MSU with fungicides against **Phomopsis in grapes** shows that **1-day-old** residues of fungicides are removed from the plant surface by rainfall at different rates: for instance for Ziram, 0.1 inch of rain removed 25% of the residues, 0.5 inch of rain 30% of the residues, 1 inch of rain 65% of the residues, and 2 inches of rain 75% of the fungicide residues. However, fungicide activity remained pretty good despite low residues remaining even after 2 inches of rain. In comparison, Captec tended to stick better, with a 50% reduction after 2 inches of rain. Efficacy was reduced slightly but was still very good with whatever residue remained. Surprisingly, even residues of Abound, which is a systemic material and considered rainfast, were reduced by rainfall, which suggests that a certain proportion of the fungicides remains on the outside of the plant, probably in/on the cuticle. However, disease control efficacy of the remaining Abound was barely reduced. Efficacy may be reduced more with older (e.g., 1-week-old) fungicide residues where less active ingredient remains. We will investigate that this year.

The question sometimes comes up if it is better to apply a protectant fungicide before or after rain, since it can wash off during the rain event. As you can see from the grape study, fungicide efficacy was still decent even after 2 inches of rain in grapes. However, this only applies to new fungicide residues. Older residues may not be as robust. The other problem is that if extended wet conditions or wind prevent fungicide application soon after the rainfall event, it may be too late to obtain disease control, since infection may already have occurred. I would suggest that a fungicide should be re-applied if more than 2 inches or rain fell or after 1 inch of rain if the residue is 7 days old or older. A little bit of rain is not all bad, as it can help to distribute the fungicide residue over the plant surface. Be sure that the fungicide has dried well before rain falls, otherwise it will be lost immediately. Most systemic fungicides are rainfast after a few hours, but a longer period (up to 24 hours) may be needed for some fungicides to get absorbed fully by the leaf or fruit surface.

**During rainy periods, it is better to rely on systemic than protectant fungicides**, since systemic fungicides are less sensitive to wash-off by rain. Applying a mixture of systemic and protectant fungicides may be the best compromise. In addition, spreader-stickers can enhance adherence of protectant fungicides, while penetrants may speed up penetration of systemic fungicides. Technological advances ensure that many newer fungicides and fungicide formulations have excellent adhesion or absorption properties.

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# Fruitworms declining slowly, prepare for maggot

Over the past week, fruitworm activity remained steady. The amount of fruitworm egglaying and feeding damage observed at the farms we scouted was similar to what we saw last week. Cranberry fruitworm moths were caught at all farms scouted – in West Olive, Holland, Covert and Grand Junction, but the number caught is declining at most of our monitoring sites. Cherry fruitworm moths were caught only at the two Ottawa County farms, and the flight of this pest in Van Buren County is ending. Cherry fruitworm eggs were not observed at any of the scouted farms, but cranberry fruitworm eggs were found at the Holland, Grand Junction and Covert farms. Freshly-laid cranberry fruitworm eggs were also detected at some other high-pressure fields. A slight increase in early fruitworm feeding damage (much less than 1% of berries damaged) was seen at all the farms we scouted (see figure 7 for typical early fruitworm damage). Egglaying by cherry fruitworm should end in the next week to 10 days at the farms we monitor in Van Buren and Ottawa counties, and cranberry fruitworm egglaying should continue through 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 information 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) were seen at all the scouted farms, and we are still getting reports of aphid activity at many other farms in southwest Michigan. Parasitized aphids were seen at the West Olive farm (see figure 8). Check bushes for aphid colonies, particularly on farms where there are varieties that are susceptible to blueberry shoestring virus.

Leafroller larvae were not observed at any of the farms. Bushes can tolerate some leaf area loss from these insects, and insecticides used to control fruitworms usually control leafrollers as well.

We have received additional reports of lecanium scale infestations in Jersey fields at some Van Buren and Ottawa County farms. Scouts and growers should be on the lookout for scale especially in Jersey fields. See the blueberries.msu.edu website for more info on these pests.

Growers and scouts should be hang traps to monitor blueberry maggot this week. For more information about monitoring for this pest, see the blueberries.msu.edu website or the June 6, 2010 edition of this newsletter.

**Fig 7.** Look out for developing fruitworm damage, seen as early-ripening fruit and/or insect frass; *Photo: K. Mason.*

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

**Fig 9.** Parasitized aphid; *Photo: K. Mason.*

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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 | 6/7 | 1 | 57 | 15 | -- | -- |
| | 6/14 | 0 | 58 | 15 | set | -- |
| Grand Junction | 6/7 | 0 | 17 | 15 | -- | -- |
| | 6/14 | 0 | 6 | 15 | set | -- |
| | | | *OTTAWA COUNTY* | | | |
| Holland | 6/7 | 1 | 6 | 5 | -- | -- |
| | 6/14 | 1 | 6 | 10 | set | -- |
| West Olive | 6/7 | 2 | 2 | 15 | -- | -- |
| | 6/14 | 1 | 7 | 30 | set | -- |

# Blueberry aphid management

Blueberry aphids (*Illinoia pepperi*) are the vector for blueberry shoestring virus which can cause bush decline and significant yield reductions. The ability of this aphid to transmit other blueberry viruses such as blueberry scorch virus is not known, but is currently being investigated at MSU. Because of the ability of theses insects to serve as vectors of plant disease, aphids should be managed to minimize virus spread in infected fields.

Aphids hatch from overwintering eggs during early bloom and build their colonies through asexual reproduction. Aphid growth is most limited by nitrogen, so they tend to grow fastest on new young growth and especially on heavily fertilized bushes. Young shoots that sprout after spring rains also tend to be very susceptible.

Populations can grow quickly through May and June, with warm weather promoting faster growth. Biological control agents such as ladybeetles, lacewings, and tiny parasitic wasps can often prevent or delay population growth, and we have seen much faster growth of aphid colonies on bushes where natural enemies were excluded. Growers should be monitoring fields for aphids and controlling this pest in fields where shoestring symptoms have been detected.

**Scouting for aphids.** Aphids are most often found on the undersides of young leaves at the base of plants. To scout for aphids examine two young shoots near the crown on each of 10 bushes in a field and record the number of shoots where aphids are found. Multiply by five to get the % infested shoots. Tracking this number through the growing season can help identify whether populations are increasing, remaining steady, or declining. It is also a good idea to record the number of shoots with parasitized aphids to get a measurement of the level of biocontrol present in your field. Be sure to sample weekly from as wide an area in the field as possible to have a better chance of detecting whether aphids are present.

**Fig 10.** Closeup photo of a blueberry aphid, *Illinoia pepperi*; *Photo: R. Isaacs.*

**Varietal susceptibility to shoestring virus.** Some varieties are resistant to shoestring virus. Resistant varieties include Bluecrop and Atlantic. Varieties with moderate resistance include Draper, Aurora, Liberty, Legacy, and Brigitta. Aphid control should be considered in fields of susceptible varieties, especially if there are symptoms of shoestring virus present. Aphid control is most important in fields containing varieties that are susceptible to the shoestring virus, such as Jersey, Blueray, Burlington, Earliblue, Elliott, Jersey, Rancocas, Rubel, Spartan, and Weymouth. If fields of these varieties contain symptoms of shoestring, aphid control should be a priority during the season and infected bushes showing symptoms should be tagged and removed in the late fall once aphids are not able to be spread through the field during removal.

**Fig 11.** Look on the underside of leaves, especially at the base of bushes, to find aphid colonies; *Photo: R. Isaacs.*

**Aphicides for control of blueberry aphid.** There are some aphid control materials available to blueberry growers that have excellent activity. These should be applied after bloom in June as aphid populations start to increase, with application by ground sprayers to ensure coverage of the lower parts of the bush. Good coverage is essential for effective aphid control, and this will be more challenging in weedy fields. Controlling the aphids now will limit spread of the virus, thereby reducing the loss of yield or need for removing infected plants.

***The most effective insecticides for aphid control are the systemic neonicotinoid insecticides Assail 30SG (2.5-5.3 oz/ac), Provado (4 oz), and Actara (3-4 oz).*** Foliar application of one of these products will move in treated leaves, helping ensure that aphids receive a lethal dose. They also provide long-lasting control; because these insecticides are very effective and blueberry aphids do not readily form winged individuals, getting excellent control early in the season typically provides season-long control.

Selection of an insecticide for aphid control may be made considering the other pests present, to get multiple insects controlled with one spray. For example, Assail and Provado are also labeled for blueberry maggot (check the rates!), and Assail is also very effective against fruitworms.

Soil-applied neonicotinoids Admire and Platinum can also be used to provide

*Continued next page.*

Soil-applied neonicotinoids Admire and Platinum can also be used to provide aphid control. These must be banded under the bush and watered in to allow them to get into the plant tissues. With the time needed for uptake into the foliage, these applications should be made soon after bloom to allow time for uptake before aphid populations get too large.

Broad spectrum insecticides applied after bloom for control of other pests such as fruitworms can also provide some control of aphids. Lannate and the various pyrethoids registered for blueberry are active on aphids if applied to target the lower shoots. However, these can also be disruptive to natural enemies, so fields should continue to be monitored for aphids to ensure that the populations do not increase again later in the season.

**Harvest-time considerations.** In mechanically-harvested fields, patterns of virus infection are often along the rows, indicating spread by harvesters. Aphid control prior to harvest is particularly important in fields with a history of shoestring virus infection to prevent this method of spread. Washing harvesters before moving to the next field is a simple strategy to further reduce the spread of BBSSV within and between blueberry farms.

**New blueberry aphid and virus publication from MSU.** MSU has produced a new bulletin titled "Blueberry Aphid and Shoestring Virus" which is MSU Extension bulletin E3050. This is available for purchase through the MSU Publications office, and can be downloaded as a FREE printable version for free from this webpage: www.blueberries.msu.edu/pdf/E_3050.pdf

***Rufus Isaacs***
***Department of Entomology***
***Michigan State University***



# 2010 grower meetings

**JUNE 17 6:00PM**
**Pre-harvest meeting - Ottawa County**
Location: Port Sheldon Township Hall
16201 Port Sheldon Rd., West Olive (1.5 miles West of Carini Farms)
Information: Carlos Garcia, 616-260-0671

**Please note location change!**

**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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