

# Northern Michigan FruitNet 2016 Northwest Michigan Horticultural Research Center

## Weekly Update

Reminder: Today is the first day of IPM Updates...we hope to see you there! Schedule is below.

FruitNet Report – May 3, 2016

### CALENDAR OF EVENTS

- |            |  |
|------------|--|
| 5/6        | <b>Pesticide Safety Training</b><br>Wunsch Farms Packing Shed                                    |
| 5/3 – 6/28 | <b>Leelanau County IPM Updates, 12PM – 2PM</b><br>Jim and Jan Bardenhagen's Farm (details below) |
| 5/3 – 6/28 | <b>Grand Traverse County IPM Updates, 3PM – 5PM</b><br>Wunsch Farms (details below)              |
| 5/4 – 6/29 | <b>Antrim County IPM Updates, 10AM – 12PM</b><br>Jack White Farms (details below)                |
| 5/4 – 6/29 | <b>Benzie County IPM Updates, 2PM – 4PM</b><br>Blaine Christian Church (details below)           |

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### What's New?

- **GROWING DEGREE DAY ACCUMULATIONS AS OF May 2, 2016 AT THE NWMHRC**
- **2016 Growth Stages as of 5/2/16**
- **Northwest Michigan Fruit Regional Report – May 3, 2016**

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**Northwest Michigan Fruit Regional Report – May 3, 2016**

*The northwest region is approaching bloom time in cherries.*

Emily Pochubay and Nikki Rothwell

## **GROWING DEGREE DAY ACCUMULATIONS AS OF May 2, 2016 AT THE NWMHRC**

<b>Year</b>	<b>2016</b>	<b>2015</b>	<b>2014</b>	<b>2013</b>	<b>2012</b>	<b>2011</b>	<b>26 Yr. Avg.</b>
<b>GDD42</b>	223	185	108	158	450	134	231.8
<b>GDD50</b>	85	67	27	74	225	40	98.4

### **2016 Growth Stages as of 5/2/16**

Bartlett Pear – Green cluster

Potomac Pear – Ear. white bud

Mac – Tight cluster

Gala – Tight cluster

Red Delicious – Tight cluster

HoneyCrisp – Ear. tight cluster

Montmorency – Late green tip

Balaton – Bud burst

Hedlfingen – Late bud burst

Gold – Bud burst

Napolean – Ear. bud burst

Riesling – Scale crack

### **Weather and Crop Report**

Temperatures have remained cool across northwest Michigan. Tree development has moved gradually with the recent cool temperatures, but growers have disease control in mind with new green tissue continuing to show up, albeit slowly. Daytime temperatures over the weekend barely reached 60 degrees F, and the overall average temperatures have been in the mid-40s for the past week. Weather predictions for the coming week are variable and range from a high of 68 degree F to a low of 54 degrees F for the daytime highs. If warmer conditions prevail, tree development will move quickly, and

growers should continue to protect against spring diseases. Thus far, we have accumulated 223 GDD base 42 and 85 GDD base 50.

Rain has been predicted at low levels over the weekend and into this week. We received some spotty rainfall throughout the region on 1 May, but at the NWMHRC, the Enviroweather station did not record any rainfall. Soil moisture conditions are drying out, as we have had no appreciable rainfall since 24-25 April.

Tree planting continues across the region. Growers are also removing brush from the orchard and wrapping up pruning for 2016. With bloom time for cherries in the near future, growers are preparing to move bees into the orchards. Thus far, we have received reports that the strength of honeybee hives is strong.

### **Pest Report**

Some areas across the region received a small amount of rain over the weekend, but because the wetting period was short and temperatures were cool, there were no apple scab infection periods reported on Enviroweather for the northwest region. Although rain was not reported on the NWMHRC Enviroweather station, conditions were wet on Sunday and we checked for spore discharge; no spores were found. It is still early in the primary apple scab phase

and we encourage growers to be ready to protect green tissue when the forecast calls for rain, which is currently predicted tonight into tomorrow morning. The NWMHRC set biofix on April 17 and according to the apple scab model, 17% of ascospores are mature and 3% have discharged at this time.

**Table 1. Apple scab spore discharge**

<b>Date Collected</b>	<b>Time Collected</b>	<b>Rod 1</b>	<b>Rod 2</b>	<b>Avg # Spores</b>
4/21/16	1:30 PM	NA	10	10
4/25/16	9:30 AM	37	50	43.5
4/26/16	8:15 AM	9	4	6.5
5/1/16	1:30 PM	0	0	0

Inoculum levels for American brown rot have been relatively low in most orchards due to low infection levels in the last two seasons; however, some orchards may have a higher level of inoculum. As we approach bloom time in sweet cherries, American brown rot could be a concern if overwintering mummies are present, temperatures are warm during bloom, and if we have rain followed by high relative humidity ~90%. No rain and a low relative humidity (60% or lower) significantly reduces the likelihood of blossom infection from this disease. Several sterol inhibitors are available for American brown rot management; however, Rovral 4 F at 2.0 pt per acre is still the optimal option for excellent efficacy and for resistance management.

As we approach bloom in tart cherries, European brown rot could be a concern if the weather continues to be cool and wet and particularly in orchards that have slow drying

conditions. Growers with European brown rot susceptible orchards, particularly Balatons, that are in the popcorn stage should consider protecting these trees from possible infection as the forecast is currently predicting temperatures in the 40s and rain for Wednesday. Although the variety Balaton is more susceptible than Montmorency, we have observed European brown rot in in Montmorency when weather conditions favor this disease (thus far, conditions this spring have been conducive for EBR). Two applications of an efficacious material, one application at popcorn and one application at bloom, is the recommended strategy for European brown rot management. Please refer to the article, *New-old options for European brown rot control in tart cherries*

([http://aqbioresearch.msu.edu/uploads/396/37126/2016\\_FruitNet/gws\\_EBRControl2016NR1.pdf](http://aqbioresearch.msu.edu/uploads/396/37126/2016_FruitNet/gws_EBRControl2016NR1.pdf)) for current information on fungicide efficacy.

Cherry leaf spot is a concern in cherries that have unfolded bract leaves and true leaves. Due to challenging conditions last spring, many orchards became infected with leaf spot early that resulted in high infections and earlier than normal defoliation. Preventing early leaf spot infections will help to minimize the degree of infection later this season; this is particularly important for trees that could have been stressed by early leaf loss last season. We would like to remind growers of the 10-D retreatment interval for chlorothalonil when applied using alternate row middle applications and/or full cover applications.

No American plum borer or oriental fruit moth have been detected. We found an average of seven green fruit worm moths in traps at the station this week.

### **Wine Grapes**

*Duke Elsner*

There has hardly been any change in the condition of grape buds. The only variety to show any signs of bud swell at the research center is Frontenac. Things should start to move along later this week if the predicted temperatures come to pass.

The next "First Friday" meeting, co-hosted by Parallel 45 Vines & Wines, will be held on May 6, 3-5 pm at 2 Lads Winery on Old Mission Peninsula. Mark Ledebuhr of Application Insight, will be presenting information on sprayer rate controllers, drift management, and visualizing deposition patterns.

### **Vineyard Volunteers Needed at the Northwest Michigan Horticultural Research Center**

*Duke Elsner*

We still have a lot of pruning and tying left to do at the research vineyard. I'm looking for volunteers to help finish the job next Wednesday and Thursday, May 11 and 12. Weather permitting, we'll start at 8:00 am and work until 5 pm. With a big enough crew it might be possible to wrap it up in one day.

Please contact me at 231-357-8353 or [elsner@msu.edu](mailto:elsner@msu.edu) if you can help out or would like more details. Please bring your own pruning shears and loppers. If the weather is questionable, call me before heading over to the research center.

## **Saskatoons**

*Duke Elsner*

Earlier sites are getting into the white tip stage. I have not seen any insect activity to this point. We are not certain of the prime infection periods for Entomosporium leafspot or saskatoon-juniper rust, but these fungal diseases may now be releasing spores if rainy weather occurs.

The 2016 pesticide recommendations for saskatoons are now available through my office—contact me at [elsner@msu.edu](mailto:elsner@msu.edu) to receive them by a return email.

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## **2016 IPM Update Schedule**

**Emily Pochubay and Nikki Rothwell  
Michigan State University Extension**

Tree Fruit IPM Updates beginning the first week of May through mid-July (as needed) will highlight management of the seasons current potential pest challenges dictated by weather and pest biology. Attendees are encouraged to bring examples of pests and damage found on the farm to these workshops for identification and discussion. Workshops will be held weekly in Leelanau and Grand Traverse counties and bi-weekly in Antrim and Benzie counties. Tree fruit growers are welcome to attend meeting at any of the locations and times that are most convenient (see below). These workshops are free and do not require registration. We are looking forward to seeing you in a few weeks! For more information, please contact Emily Pochubay ([pochubay@msu.edu](mailto:pochubay@msu.edu)), 231-946-1510.

### **Leelanau County**

**Location:** Jim and Jan Bardenhagen, 7881 Pertner Road, Suttons Bay

**Dates:** May 3, 10, 17, 24, 31; June 7, 14, 21, 28

**Time:** 12PM – 2PM

### **Grand Traverse County**

**Location:** Wunsch Farms, Phelps Road Packing Shed, Old Mission

**Dates:** May 3, 10, 17, 24, 31; June 7, 14, 21, 28

**Time:** 3PM – 5PM

### **Antrim County**

**Location:** Jack White Farms, 10877 US-31, Williamsburg (south of Elk Rapids on the southeast side of US-31)

**Dates:** May 4, 18; June 1, 15, 22, 29

**Time:** 10AM – 12PM

### **Benzie County**

**Location:** Blaine Christian Church, 7018 Putney Rd, Arcadia, MI 49613

**Dates:** May 4, 18; June 1, 15, 22, 29

**Time:** 2PM – 4PM

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## **Retain Use to Increase Sweet Cherry Yields**

N.L. Rothwell and E. A. Pochubay, NWMHRC

In recent years, many growers have started to use ReTain in their sweet cherry blocks to increase fruit set and ultimately increase their yields. ReTain is a plant growth regulator that has been shown to extend flower viability in cherry by reducing ethylene production in cherry flowers and delaying flower and stigmatic senescence. Due to this effect, flowers that last longer have a higher likelihood to be successfully pollinated, and increased pollination results in a higher yield. Research has shown that ReTain works best if used before poor pollinating conditions (wet, cool, windy weather or low honeybee activity) or on varieties that tend to be shy-bearing.

Moderately cool temperatures are predicted to continue this weekend and into next week around northwest Michigan. Sweet cherries are currently at late side green to early budburst here at the NWMHRC. However, some sweet cherry orchards around the region are further along. If the weather predictions are correct, we could be at bloom around 5-7 May, and data show that ReTain applications are more effective when applied early. With the predicted cool conditions, bee activity will likely be low making ReTain applications particularly important this year.

We conducted a ReTain trial at three grower farms in 2014. ReTain was applied in two Balaton blocks and one sweet cherry var. Regina block. Each block was approximately 10 acres where half of the block was treated and the other half untreated. ReTain was applied at the recommended rate of 1 pouch per acre (11.7 oz/A) at popcorn to early bloom stage at 100 gal/A. No surfactants or fungicides were tank mixed with the product. We found that ReTain significantly improved yields in the Regina orchard

(Figures 1 and 2) and one of the Balaton orchards; in both of these trials, ReTain was applied at <10% bloom. In the second Balaton orchard, the ReTain application was made at 70% bloom, and the PGR had no effect on yield. Therefore, we recommend making ReTain applications early: popcorn to first bloom.

A team from Washington State University and Oregon State University has also conducted ReTain trials. ReTain was applied at four stages during bloom: popcorn, 10 percent full bloom, 50 percent full bloom, and full bloom. The ReTain treatment at 10 percent full bloom gave as much as a 20 percent increase in fruit set compared with the control. That was a gain of almost 9 pounds per tree or 2 tons per acre. Tests with var. Tieton also resulted in significant increases in fruit set. However, unlike the results we observed in Michigan, the western team found that each of the application timings improved fruit set, though there was no consistent trend. They concluded that there could be a broad window when the treatment can be effective. Some of the variability in results could have been attributable to the weather at the time of or immediately after application as warm temperatures would have hastened the senescence of the ovule.

Although the results varied from our trials in Michigan, we are still recommending that ReTain be sprayed early in the season, either popcorn or first bloom. The rate of ReTain is one pouch per acre (11.7oz/acre). The more tissue on the tree, the better the response, but the key timing is early based on our results and past recommendations by the Valent Company. The spray volume is recommended at 100 gal/acre. ReTain cannot be used after petal fall, and it is not recommended if rain is expected within eight hours of application. Temperature should be monitored during application timing as the effectiveness of plant growth regulators decrease at low temperatures. Also, we recommend applying ReTain under slow drying conditions. According to the Valent representatives, they have found that treating a larger block is more effective than treating rows within a block; the overall effectiveness of the active ingredient in ReTain is improved with broad coverage.



Figure 1: ReTain-treated Regina



Figure 2: Untreated Reg

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## New-old options for European brown rot control in tart cherries

*Emily Pochubay, Nikki Rothwell, and George Sundin*

The fungal disease European brown rot caused by *Monilinia laxa* is a concern during bloom time in Michigan tart cherries because this pathogen can infect flowers and cause blossom blight. The varieties Balaton and Meteor are highly susceptible to European brown rot, much more so than Montmorency, although we have also observed infections in Montmorency orchards under optimal conditions for disease. Wet weather and temperatures in the 40s and 50s during bloom are ideal for European brown rot infection. In particular, slow drying orchards, orchards in low-lying areas, and orchards affected by fog are most susceptible to European brown rot infection in both Balaton and Montmorency varieties.

Previously, two applications of Indar, one at popcorn and one at bloom, have been the best strategy to control European brown rot. New data from Dr. George Sundin's pathology lab show other materials are also effective options for European brown rot, and rotating modes of action will help to delay the possible development of resistance in the pathogen to Indar. This study was conducted in Balaton trees, and all of the materials provided significantly better control of European brown rot compared with untreated trees (Table 1). However, there are relatively few fungicide modes of action used in tart cherry disease programs, and growers should consider how to best rotate these materials throughout their season-long disease programs.

For example, most growers should be using the SDHI materials (Luna Sensation and Merivon) at first cover to target cherry leaf spot and powdery mildew, and a second SDHI application at pre-harvest for fruit brown rot and to provide longer residual control



of leaf spot. Although the SDHIs are effective against European brown rot control at bloom time, these materials may not be the best for maintaining a sustainable resistance management strategy. As mentioned previously, Indar has been the choice material for European brown rot, and as a result, there is a higher risk for resistance development to Indar. Therefore, choosing an alternative to Indar will help prevent chances of resistance development. Of the remaining materials, Gem and Topsin M have provided good control of European brown rot and have alternate modes of actions from the commonly used SDHIs and Indar. These two materials provided better control compared with Captan alone, and the data show that Gem and Topsin were comparable to Indar and the SDHIs (Table 1).

**Table 1. European Brown Rot Efficacy Trial Results**

Treatment (Rate/Acre)	Fungicide Class	% Cluster Infections	% Terminal Strikes
1. Luna Sensation (5 fl oz) + R56	SDHI	1.5 c	0.3 c
2. Gem (3.8 fl oz) +R56	Strobilurin	6.0 c	4.0 c
3. Topsin M (30 fl oz)	Benzimidazole	3.0 c	1.3 c
4. Topsin M (30 fl oz) + Captan 80 WDG (2.5 lb)	Benzimidazole	3.5 c	2.0 c
5. Captan 80 WDG (2.5 lb)	Heterocyclic compound	29.3 b	18.5 b
6. Merivon (5.5 fl oz) + Sylgard	SDHI	1.8 c	0.8 c
7. Indar (6 fl oz) + LI 700	Sterol Inhibitor	4.0 c	2.5 c
8. Indar (12 fl oz) + LI 700	Sterol Inhibitor	1.3 c	1.3 c
9. Untreated control		46.3 a	25.5 a

The European brown rot fungus overwinters on the previous seasons' infected shoots and begins sporulating during wet and cool conditions in the spring. European brown rot infections have been low in recent years, and most orchards likely have a low inoculum level going into the 2016 season. However, if the current cool and wet conditions continue through bloom, this weather will favor European brown rot infection. Under these optimal conditions, this disease is a particular concern in orchards that meet the previously mentioned criteria. Additionally, Balaton trees are highly susceptible and should be protected from infection even in suboptimal conditions for EBR control. Two applications of an efficacious material at popcorn and bloom remains the recommended control strategy for 2016.

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## **Pesticide Safety Training**

**Wunsch Farms Packing House**

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**Friday, May 6, 2016** - Wunsch Farms will be hosting a Pesticide Safety Training Workshop on Friday, May 6, 2016. The training will be in at the packing house at 16888 Wunsch Rd. at 9:00 am. It will be conducted by representatives from Telamon Corporation and is free for any farmworkers or dependents of farmworkers. Those interested can RSVP before next Wednesday by contacting Raul Gomez at [graul40@gmail.com](mailto:graul40@gmail.com) or 231-944-8478. The training will last about 1 hour and will be in Spanish. If you are interested in attending an English class, please reach out to Raul and they will arrange an English Training, immediately following the Spanish version. Attendees will not receive certification or certification credits but the training will be a great learning opportunity and attendees will cover material that anyone taking the certification test needs to know.

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## **Looking for Input from all Businesses Including Farms in Leelanau County**

You and your business are important to the vitality of the Leelanau Peninsula, and the newly-created Leelanau Peninsula Economic Foundation wants to hear from you. What's going well for you in your business? What issues keep you up at night? How can a non-profit economic enabler like the LPEF help businesses in Leelanau County thrive?

The LPEF is conducting a brief e-survey to learn about your dreams, challenges, and your suggestions concerning what they should focus on as they work to strengthen the economic vitality of Leelanau businesses and communities.

Please take a few moments to click on the link below to share your thoughts. The survey's completely anonymous and should take less than 10 minutes of your time.

Thank you,

Leelanau Peninsula Economic Foundation Board

<http://www.surveygizmo.com/s3/2631180/LPEF-Leelanau-Business-Survey-2016>

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## **Measuring spotted wing Drosophila impacts – your help needed!**

This survey will help researchers identify impacts of spotted wing Drosophila (SWD) on fruit growers and look for new management tactics and programs, improved insecticide efficacy and SWD training.

Posted by **Rufus Isaacs**, and Larry Gut, Michigan State University Extension, Department of Entomology, MSUE News

Michigan State University researchers are part of a recently funded project, **“Sustainable Spotted Wing Drosophila (SWD) Management for United States Fruit Crops,”** and the team is surveying fruit growers with two goals:

- 1 Measure the impact of SWD throughout the United States.
- 2 Guide our project activities over the next four years.

This five-year project, coordinated by North Carolina State University, is developing national research and extension projects to minimize the impacts of SWD. They include new management tactics and programs, improved insecticide efficacy for SWD and information and training on SWD for growers, extension agents and others. In order to achieve this and ensure the research and extension efforts match the needs of growers, the project is collecting information on the impacts of SWD on fruit growers, current management practices and preferences, and your requirements for better management of SWD. Participation is voluntary and the survey does not collect personally identifying information. The data will only be analyzed and reported in aggregate form.

We would like to get feedback from as many growers as possible! So, please complete the survey here: **Sustainable SWD Management Grower Survey**  
Contact me at isaacsr@cns.msu.edu for additional information.

<https://survey.ncsu.edu/swd/>

Funding for this project is provided by the National Institute of Food and Agriculture, U.S. Department of Agriculture Specialty Crops Research Initiative under Agreement No. 2015-51181-24252.

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## **RecycleSmart Household Hazardous Waste Drop-Off – Upcoming**

### **Dates**

*Growers can bring back pesticides of any quantity to any county, free of charge*

Leelanau's HHW Collections are taking place on May 14, July 9, August 27, and October 8.

[http://www.leelanau.cc/downloads/hhw\\_flyer\\_2016\\_final\\_1.pdf](http://www.leelanau.cc/downloads/hhw_flyer_2016_final_1.pdf)

Antrim has two events this year: May 14 and August 6:

<http://www.antrimcounty.org/hazardous.asp>

Benzie is holding two HHW Collections on June 25 and July 23:

<http://www.benzieco.net/Household%20Hazardous%20Waste%20Brochure%202016.pdf>

Household hazardous waste products should be handled with care when preparing them for transport to the drop-off event. Keep products in original containers and don't mix products together. Keep containers tightly sealed, packed in a box in an upright, stable position. Transport HHW as far away as possible from you in your vehicle, such as in the bed of a pick up or car trunk.

Items accepted at the HHW collection events include: oil-based paint, latex paint, solvents, automotive fluids, household cleaners, lawn and garden chemicals, pesticides, batteries, fluorescent light bulbs and more.

Small businesses, organizations and schools may qualify to dispose of HHW at a drop-off event. Visit [RecycleSmart.info](http://RecycleSmart.info) for details about Conditionally Exempt Small Quantity Generator (CESQG) specifications.

For more information, visit [www.RecycleSmart.info](http://www.RecycleSmart.info) or call the RecycleSmart Hotline at 231- 941-5555.

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## Root pruning guide for apple trees to reduce excessive vigor

*There are many benefits to pruning roots on apple trees to control excessive tree vigor.*

Posted by **Phil Schwallier**, and Amy Irish-Brown, MSUE News

Using root pruning to help control excessive tree vigor has been researched by Dave Ferree of [Ohio State University](http://Ohio State University) and [Jim Schupp](http://Jim Schupp) of [Pennsylvania State University](http://Pennsylvania State University). Root pruning is accomplished by pulling an offset subsoiler blade or a large coulter along the tree row. The blade cuts roots as it passes the trees. The blade should be set at a cutting depth of near 12 inches and pass near the trees at 1-4 feet from the tree on both sides of the row. Generally, pruning deeper has no additive effect on the trees – most major roots are within 12 inches of the soil surface. About 60 percent of the total tree roots

need to be cut to have a significant effect on the trees. A lesser percent of root pruning will have less effect on the vigor control of the trees.

Use the trunk diameter as a guide to estimate root pruning distance from the tree. A root pruning distance of three times the trunk diameter will cause severe response; four to five times will cause a moderate tree response and five to seven times will cause a mild tree response. The root pruning effects may be evident for two years, usually always more than one year, but root pruning can be performed every year.

Root pruning should be done starting at apple bloom and up to two weeks after full bloom. Earlier timing will stress trees sooner with greater tree response and later timing will give less stress and, therefore, less tree response and vigor control.

Tree vigor and crop load will impact the success of the root pruning operation. In the situation of high tree vigor and a light crop load, the tree will be less responsive to the pruning. Extremely vigorous trees can be double root-pruned 30 days apart for an increased effect.

According to Michigan State University Extension, bloom time root pruning has no effect on fruit set. Root pruning will generally reduce fruit size by perhaps 0.125 inches, but can reduce diameter up to 0.25 inches in very hot dry years or with very aggressive pruning. Yields will be reduced from the reducing in fruit diameter, but this is typically not extreme. Vegetative shoot growth, branching and trunk diameter will be reduced. Root pruning increases light penetration into trees, improves spur quality and increases fruit color. Root-pruned trees tend to have lower nitrogen (N), phosphorus (P) and potassium (K) in leaves. Root pruning enhances return bloom (perhaps doubling return bloom), and reduced fruit drop near harvest has been reported. Use root pruning on excessively vigorous trees, excessively large fruited varieties and varieties/blocks that resist blooming or setting fruit.

In some cases, trees can lean after root pruning, and with dwarf trees the trellis is important. However, leaning generally is not noticeable. For dwarf trees and in light soil, supplemental irrigation may be needed.

**Effects of root pruning include:**

- 3 Reduced tree vigor.
- 4 Reduced shoot growth.
- 5 Reduced harvest fruit drop.
- 6 Reduced fruit size.
- 7 Reduced trunk diameter.
- 8 Increased light penetration into trees.
- 9 Increased spur quality.
- 10 Increased fruit red color.
- 11 Increased fruit firmness.
- 12 Increased return bloom.
- 13 Increased need for irrigation.

- 14 Increased root suckers at the pruning cut site.
  - 15 May increase fruit set.
  - 16 Lowered leaf N, P and K.
  - 17 May increase tree leaning.
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## Mummy berry springs into action: How to manage this disease

*Mummy berry has germinated in Michigan blueberry fields and apothecia or apothecial initials are present. Growers should scout fields for the fungus and be prepared to manage this disease.*

Posted by **Annemiek Schilder**, Michigan State University Extension, Department of Plant, Soil and Microbial Sciences, and Mark Longstroth, MSU Extension, MSUE News



**Stages in mummy berry germination and apothecium development. Photos by Timothy Miles (top) and Mark Longstroth (bottom).**

Mummy berry is caused by the fungus *Monilinia vaccinii-corymbosi* and is characterized by blighting of young shoots, which are referred to as “shoot strikes.” Fruit infection leads to the shriveling and mummification of berries, hence the name mummy berry. These mummies overwinter on the ground below blueberry bushes. At the beginning of the growing season, small, trumpet-shaped apothecia develop on the overwintered mummies and start releasing ascospores which infect young leaves.

Previous research has shown that the optimum temperature for formation of apothecia is 50 to 57 degrees Fahrenheit. These temperatures are also very conducive to leaf infection, which requires four to six hours of continuous leaf wetness under those conditions. Leaf wetness can come from rain, dew, fog or overhead irrigation water. Infection can occur at temperatures as low as 36 F, but a wetness period of 10 hours is required for infection at that temperature. The risk of infection is reduced at temperatures of 80-86 F and above.

In general, longer wetness periods lead to more infections, observed as higher numbers of shoot strikes. Also, frost injury increases susceptibility of the shoots to infection. In past trials, fungicide applications within 24 hours of a frost event significantly reduced shoot strike incidence.

<b>Mummy berry shoot infection conditions for lowbush blueberries</b>					
<b>Wetness Duration (h)</b>	<b>Average temperature (F) during wet period</b>				
	<b>36</b>	<b>43</b>	<b>50</b>	<b>57</b>	<b>65</b>
2	0	0	0	0	0
4	0	0	0	0	0
6	0	Low	Low	High	High
8	0	Moderate	High	High	High
10	Moderate	High	High	High	High
15	Moderate	High	High	High	High
24	High	High	High	High	High

Table source: Paul Hildebrand, Ag Canada, Nova Scotia.

At this time in Michigan fields, mummies have germinated and apothecia or apothecial initials are present. We had already started seeing “apothecial initials,” the horn-like structures developing on overwintered mummies in March, indicating that the mummies were ready. The mummy germination rate is 20 to 45 percent this spring, with higher germination rates and more advanced development at wetter locations. This germination rate is pretty typical of most years in Michigan. Spore release starts when the apothecial opening is about 2 millimeters and continues to increase as the apothecia expand.

Open apothecial cups have been reported and now that the blueberries are at green tip or leaf expansion, this indicates a risk of primary infection. In general, the more apothecia that are present and the larger the apothecial cups, the greater the risk of infection. Michigan State University Extension therefore advises scouting in fields with a history of mummy berry to confirm the stage of development of the fungus. Continued scouting will also help determine when infection risk has passed. Remember that there can be several flushes of apothecia depending on soil moisture. Later flushes of

apothecia are actually more risky due to the presence of shoot strikes with fresh spores during bloom.

When soils stay cool and moist, apothecia may last for two to three weeks and release spores on a daily basis, especially in the morning as the relative humidity starts to drop. Ascospores are dispersed by wind, which picks up in speed in late morning. Warm and dry soils will lead to quicker deterioration of the apothecia. You can use MSU’s [Enviro-weather](#) website to monitor for mummy berry infection conditions at nearby weather stations. There is no specific model for mummy berry, but blueberry growers can use the [Multi-Crop Disease Summary](#) tool in the fruit section of [Enviro-weather](#) to find the hours of wetness and the average temperature during the wetting period for all the stations in the region.

Fungicides work best when applied preventatively (before infection) because the fungus grows too fast during optimal conditions for post-infection sprays to work well. While the risk of fungicide resistance development appears to be relatively low for this pathogen, it is nonetheless advisable to alternate fungicide chemical classes as indicated by different Fungicide Resistance Action Committee (FRAC) code numbers. If shoot strikes are controlled well – you can scout fields to confirm this – and no shoot strikes are present during the bloom period, the risk of fruit infection is minimal, unless there is a nearby field where shoot strikes are present. Spores produced on the shoot strikes can be carried by bees to nearby fields that are in bloom. Be careful with fungicide applications during bloom; avoid spraying after bee hives have been placed in the field or spray at night when bees are not active.

<b>Fungicide efficacy against mummy berry in blueberries.</b>				
<b>Trade Name</b>	<b>Active ingredient</b>	<b>FRAC Code*</b>	<b>Shoot strike</b>	<b>Fruit infection</b>
<b><i>Systemic Fungicides</i></b>				
Indar	fenbuconazole	3	Good efficacy	Good efficacy
Proline	prothioconazole	3	Good efficacy	Good efficacy
Quash	metconazole	3	Good efficacy	Good efficacy
Tilt	propiconazole	3	Good efficacy	Moderate efficacy
Protexio	fenpyrazamine	17	Good efficacy	Good efficacy
Omega	fluazinam	33	Moderate efficacy	Moderate/Good efficacy
Pristine	pyraclostrobin + boscalid	11/7	Moderate efficacy	Good efficacy
Quit Xcel	azoxystrobin + propiconazole	11/3	Moderate/Good efficacy	Moderate efficacy
Inspire Super	difenoconazole + cyprodinil	3/9	Good efficacy	Good efficacy
<b><i>Protectant Fungicides</i></b>				



Bravo	chlorothalonil	M5	Moderate efficacy	Poor to fair efficacy
Ziram	ziram	M3	Moderate efficacy	Poor to fair efficacy
Serenade + Nu-Film P	<i>Bacillus subtilis</i> + terpene-based adjuvant	44	Moderate efficacy	Moderate efficacy
Double Nickel 55	<i>B. amyloliquefacies</i>	44	Moderate/Good efficacy	Moderate efficacy
Sulforix	calcium polysulfide	M2	Moderate efficacy	Poor to fair efficacy
Oso	polyoxin D zinc salt	19	Moderate efficacy	Moderate efficacy
Regalia**	giant knotweed extract	P5	Moderate efficacy	Moderate efficacy

\*Fungicides sharing the same number belong to the same chemical class and thus have the same mode of action.

\*\*Add Regalia at 1 quart per acre to other fungicides such as sterol inhibitors or strobilurins to improve control.

*Dr. Schilder's work is funded in part by MSU's AgBioResearch.*

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#### **WEB SITES OF INTEREST:**

Insect and disease predictive information is available at:

<http://enviroweather.msu.edu/homeMap.php>

This issue and past issues of the weekly FruitNet report are posted on our website:

<http://agbioresearch.msu.edu/nwmihort/faxnet.htm>

60-Hour Forecast:

<http://www.agweather.geo.msu.edu/agwx/forecasts/fcst.asp?fileid=fous46ktvc>

Information on cherries:

<http://www.cherries.msu.edu/>

Information on apples:

<http://apples.msu.edu/>

Information on grapes:

<http://grapes.msu.edu>

Fruit CAT Alert Reports:

<http://news.msue.msu.edu>