

# **Northern Michigan FruitNet 2017**

## **Northwest Michigan Horticultural Research Center**

### Weekly Update

**FruitNet Report – May 23, 2017**

### **CALENDAR OF EVENTS**

<b>5/9 – 6/27</b>	<b>Leelanau IPM Updates</b> Jim and Jan Bardenhagen's Farm, 12PM – 2PM
<b>5/9 – 6/27</b>	<b>Grand Traverse IPM Updates</b> Wunsch Farms Packing Shed, 3PM – 5PM
<b>5/10 – 6/28</b>	<b>Antrim IPM Updates</b> Jack White Farms, 10AM – 12PM
<b>5/10 – 6/28</b>	<b>Benzie IPM Updates</b> Blaine Christian Church, 2PM – 4PM

### **What's New?**

- **Note from Nikki and Emily – Off to Japan**
- **Northwest Michigan Fruit Regional Report – May 23, 2017**
- **Widespread Detections of San Jose Scale in NW Michigan Tree Fruit Crops**
- **Effectively controlling plum curculio in stone and pome fruits**
- **Black stem borer management in spring**
- **Leelanau County Health Department scheduling respirator fit tests**

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## **Note from Nikki and Emily – Off to Japan**

We (Nikki and Emily) will be out of the office from 30 May until 9 June, 2017 to attend the VIII International Cherry Symposium in Yamagata, Japan. We know that this time of year is extremely busy, and we will do our best to maintain contact with all of you while we are away. We will likely have access to the internet, although we do not know how readily available it will be. The best method of contact will be through email (rothwel3@msu.edu) (pochubay@msu.edu) while texting is the second-best option if we have access to WIFI: (Nikki: 231-342-4094) (Emily: 810-241-2481). Although we will be half way around the world, we will try to make sure your questions and concerns are addressed as quickly as possible.

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## **Northwest Michigan Fruit Regional Report – May 23, 2017**

*Growers are considering their options for apple thinning and pest and disease management for the coming week*

Emily Pochubay and Nikki Rothwell

## **GROWING DEGREE DAY ACCUMULATIONS AS OF MAY 22, 2017 AT THE NWMHRC**

<b>Year</b>	<b>2017</b>	<b>2016</b>	<b>2015</b>	<b>2014</b>	<b>2013</b>	<b>2012</b>	<b>27 Yr. Avg.</b>
<b>GDD42</b>	470	435	460	316	468	770	481.2
<b>GDD50</b>	212	190	222	127	263	409	230.7

## **2017 Growth Stages as of 5/22/17**

Bartlett Pear – 7mm fruit  
Potomac Pear – Late petal fall  
Mac – Full bloom  
Gala – Ear. petal fall  
Red Delicious – Ear. petal fall  
HoneyCrisp – Ear. petal fall  
Montmorency – Late petal fall

Balaton – Late petal fall  
Hedelfingen – 8 mm fruit  
Gold – In the shuck  
Napoleon – 8 mm fruit  
Riesling – Bud burst

### **Weather Report**

Spring cannot seem to make up its mind this year. We have toggled between warm, hot, cool, and downright cold temperatures this spring. In addition to the varying temperatures, the wind seems to be omnipresent, which has posed problems for keeping tissue covered this May and has made the temperatures feel cooler than the actual air temperature. Last Tuesday and Wednesday 16 and 17 May hit daytime highs in the 80s but by Friday, we topped out at 55 degrees F. The weekend ended up being warmer than predicted, and the NWMHRC weather station recorded 70 degrees F on Sunday, 21 May. Along with the variable weather, the forecasts for rain have also been unpredictable, and coupled with the wind, these conditions have been challenging for making spray decisions.

Our growing degree accumulations for 2017 are typical of our averages, and thus far, we have accumulated 470GDD base 42 and 212GDD base 50. Overall, the region has received very little rain accumulations. The NWMHRC received less than ¼” of rain for the month of May and just under two inches of rain in the month of April. Growers have been working hard to turn on the irrigation because soils are currently extremely dry in the orchard.

### **Crop Report**

Most tart and sweet cherries are at petal fall in the region, but orchards in the Northport area are just hitting full bloom on 22 May, which is seven days behind the NWMHRC. Pollination may be a concern if the cold temperatures continue for orchards that will be in bloom for the next few days. The hot weather last week resulted in a very short bloom time for most tart cherries. The weather was warm enough for bees to fly, and we caught and/observed considerable bee activity last Wednesday and Thursday. However, the short bloom time may have limited the amount of time to pollinate the many blossoms. The cool weather and wind that came on Friday, 19 May brought much of the bee activity to a halt. Growers are reporting discolored petals on tart cherries, and some growers have alluded to the petals having a pinkish hue. These color variations may be due to the frost/freeze events earlier in May or the hot weather we had last week. Growers have also mentioned that tart cherries have some short stems out there this year.

Growers are still assessing damage in apples, particularly as we are approaching the thinning window. As Phil Schwallier mentioned at the thinning workshop last Friday, the ‘nibble thinning’ approach will be the best tool for us, even if our temperatures remain on the cool side. Apples are most susceptible to thinning at the 10mm stage, and if we are cool when that time comes, thinning becomes increasingly difficult. Therefore, growers should plan to start their thinning program at bloom (which is likely past in most

cases) or the next optimal time to thin: petal fall. We are at the petal fall timing at the NWMHRC, and even if this thinning window only takes off a portion of the crop, it will help growers achieve their optimal apple yields with less hand thinning late in the season. We really like to have temperatures above 65 for thinning materials to work optimally, and the forecast is predicting daytime highs in low 60s to low 70s in the coming days—if the forecasts are correct, we could have an optimal window for thinning. The carbohydrate model on Enviroweather is predicting mild stress this week and is suggesting growers use a standard rate of thinners (Figures 1 and 2).

Station Current - Traverse City (NWMHRS) Change station

MICHIGAN STATE UNIVERSITY

**Enviroweather**  
 Weather-based pest, natural resources,  
 and production management tools

Tools for: [Field crops](#) | [Fruit](#) | [Landscape & Nursery](#) | [Trees](#) | [Turfgrass](#) | [Vegetables](#) | [More weather](#)

[Return to station page](#)

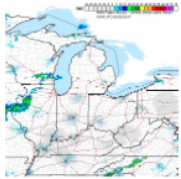
Expand All | Contract All  
  
**Resources for:**  
**Tree fruit**  
  
 📁 **Apple**  
 ▶ **Crop Development**  
 ▶ [Apple Carbohydrate Thinning](#)  
 ▶ [Apple Irrigation](#)  
 ▶ [Apple Maturity Model](#)  
 ▶ [Current status of McIntosh and apple pests](#)  
 ▶ [Seasonal history of McIntosh and apple pests](#)  
  
**Pest Management**  
 ▶ [Codling Moth](#)  
 ▶ [Obliquebanded Leafroller](#)  
 ▶ [Oriental Fruit Moth](#)  
 ▶ [Apple Scab](#)  
 ▶ [Fire Blight](#) of apple

## Traverse City (NWMHRS), Michigan

### Latest observations at Traverse City (NWMHRS)

05/22/2017 03:00 PM (Station online).  
 Measurements by 5-minute average or total unless otherwise indicated.

56.4 F	Air temperature	
0.02 in.	Rainfall(05/22/2017)	
58.2%	Relative Humidity	
41.9 F	Dewpoint	
WSW	Wind Direction (hourly average)	
11.7	Windspeed	
mi./hr.		
0%	Percent of last full hour wet - leaf wetness (tripod-mount)	
0%	Percent of last full hour wet - leaf wetness (canopy)	



National Weather Service [radar](#) and [local forecast](#) for Traverse City




Figure 1. Apple carbohydrate thinning link on the fruit resources page under Apple.

Apple Carbohydrate Thinning

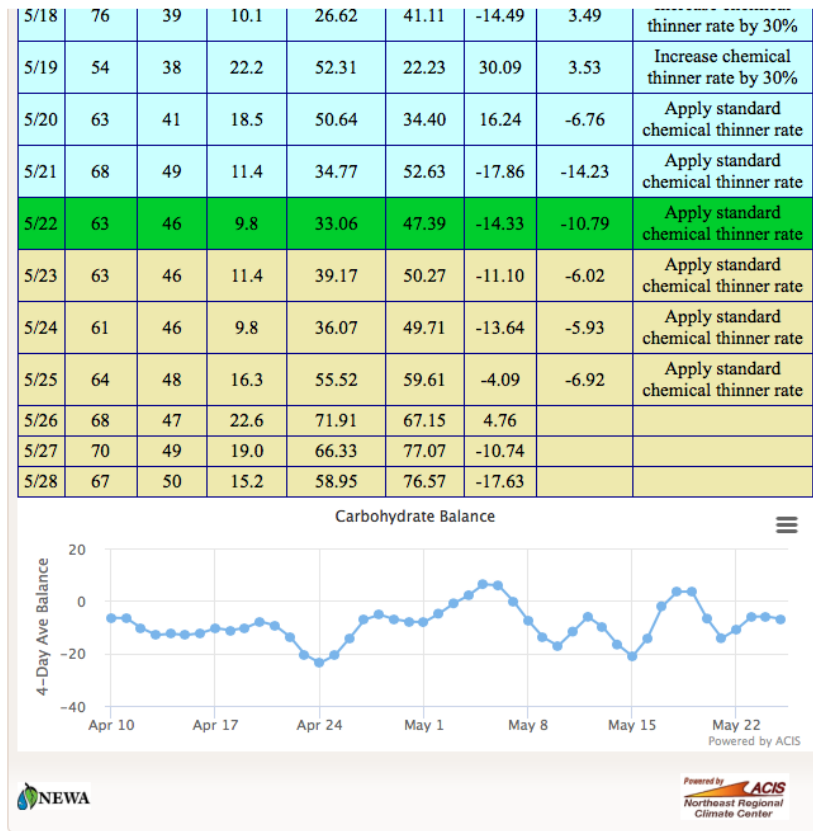


Figure 2. Apple thinning carbohydrate model output suggesting mild stress in the next three days.

**Pest Report**

Since last week’s report, spotty wetting events with variable amounts of accumulation, drying times, and considerable temperature differences throughout the region have resulted in a mixed bag of possible apple scab and cherry leaf spot disease infection periods. In the last week, the Benzie-Manistee area has received the most rainfall compared with more northerly counties, and this increased moisture provided more chances for disease progress. Beginning on 18 May, all stations in the northwest region reported wetting events; however, because temperatures were relatively cool, disease infection periods only occurred in areas with long periods of wet weather (i.e. Bear Lake, Benzonia, Eastport, Elk Rapids). In Eastport and Elk Rapids temperatures were too cool to result in a cherry leaf spot infection, but warm enough to trigger a possible apple scab infection. Many growers applied fungicides in advance of predicted rains that were predicted for Tuesday 22 May and Wednesday 23 May. The forecast for the remainder of the week currently looks relatively dry which is good news in terms of diseases.

Most orchards are more than halfway through primary apple scab at this time, but preventative scab fungicides are still important as spores are still discharging in the region and at NWMHRC’s monitoring site (Table 1). Some areas set biofix as early as April 10<sup>th</sup> and according to the scab development model more than 95% of spores have

reached maturity at this time. Areas with a later biofix (around April 17<sup>th</sup>) are currently at 85%+ spore maturity.

Growers targeted fire blight last week with antibiotics and plant growth regulator (PGRs) sprays, but recent cool weather has taken the risk of infection down dramatically for the early part of this week. A warm-up is predicted over the weekend so growers have been planning spray strategies if orchards will have viable bloom open and susceptible to fire blight. Warmer conditions will be more favorable for a positive response of PGR applications. As a reminder, the optimal timing for the first application of Apogee is king bloom petal fall followed by two additional applications spaced two weeks apart. If an orchard becomes infected with fire blight, we encourage growers and consultants to contact the NWMHRC so that we can send the sample in for resistance screening.

<b>Table 1. Apple Spore Discharge, 2017</b>		
<b>Date</b>	<b>Total # Spores</b>	<b>Avg. # Spores</b>
4/15/17	6	3
4/16/17	2	1
4/20/17	10	5
4/27/17	1	0.5
4/28/17	4	2
4/30/17	12	6
5/1/17	12	6
5/2/17	7	3.5
5/13/17	30	15
5/19/17	0	0
5/21/17	8	4
5/22/17	0	0

Planning cherry leaf spot management has been frustrating this spring with the constantly changing predictions for rain, cool temperatures, and minimal rainfall in most areas. We remind growers that the timing for in-season chlorothalonil use will end soon (at shuck-split). Although it has not been commonly used in recent years, there is a Section 24(c) label for post-shuck split applications of Bravo Weather Stik; this label expires on 12/31/2017. Please see the article, *Where can growers find the special 24(c) label for using Bravo Weather Stik past shucksplit?* for instructions on how to receive the required training and retrieve the 24(c) label. Leaf spot lesions likely from early May infections are visible at this time. Although the forecast currently looks dry, growers with infections already started will need to be diligent with their next leaf spot sprays.

A few days of warmer weather triggered insect activity last week and then recent cooler weather has slowed their activity down again. In the station trapline, green fruitworm activity jumped up to an average of 14 moths per trap, and American plum borer numbers are on the rise (Table 2). No codling moth were found this week, but they could fly in warmer weather toward the end of the week. Codling moth adults typically fly on calm evenings when temperatures are in the 60s. Similarly, plum curculio like warmer conditions, and their activity tends to be associated with periods of higher relative humidity and/or following rain on warm evenings. Growers should be ready to protect developing fruits coming out of the shuck from plum curculio oviposition. Spotted tentiform leafminer numbers were down this week and one male San Jose scale was found (Table 2).

Growers concerned with San Jose scale in sweet cherries and apples have made or are planning petal fall applications of the product Movento, which takes time to establish in the tree before crawlers emerge and begin feeding. As mentioned in previous reports, crawler activity typically occurs two weeks after peak male flight and contact insecticides can be used to target crawlers when they are active. Please refer to the article, *Widespread Detections of San Jose scale in NW Michigan Tree Fruit Crops*, for additional management information.

The first small green fruitworm and obliquebanded leaf roller (OBLR) larvae were observed in terminals last week. The insecticide Belt has been an excellent option for early season caterpillar management. As a reminder, the EPA has cancelled the labels for products containing the active ingredient: flubendiamide, which includes the products Belt and Tourismo. However, distributors and retailers are permitted to provide remaining inventories of these products to growers and growers can use products

<b>Table 2. NWMHRC Insect Trapline Data, 2017</b>					
<b>Cherry - NWMRHC</b>	<b>25-Apr</b>	<b>2-May</b>	<b>9-May</b>	<b>16-May</b>	<b>23-May</b>
Green Fruitworm	14	1	6	2	14
American Plum Borer				2	5
<b>Apple - NWMHRC</b>	<b>25-Apr</b>	<b>2-May</b>	<b>9-May</b>	<b>16-May</b>	<b>23-May</b>
Oriental Fruit Moth	0	0	0	0	0
Spotted Tentiform Leafminer				52	18
Codling Moth					0
San Jose Scale					1

containing flubendiamide through 12/31/2019. Growers should target smaller OBLR larvae, as they are much easier to kill than larger caterpillars.

We have received reports that black stem borer began emerging in the region last week. Adult black stem borers are attracted to trees that are injured/stressed due to winter injury, drought, or other reasons that would cause the tree to produce the compound ethylene. In Michigan, we have most commonly found these boring insects attacking stressed apple trees in high-density orchards often adjacent to woodlots. Healthy trees and older trees are less susceptible to this pest because the trees produce resin that wards off boring insects. The best management option for this pest is to determine and eliminate the cause of the trees' stress. Otherwise, recent research conducted by Dr. Larry Gut's lab has provided variable results for using insecticides timed to target the emerging adult beetles; please refer to the articles, *Black stem borer: An opportunistic pest of young fruit trees under stress* for more information on the biology of this pest and to *Black stem borer management in spring* for management information.

## **Wine Grapes**

*Duke Elsner*

—Most sites in NW Michigan are at bud burst through early shoot growth. Climbing cutworm feeding activity should be done for the year. For the next couple of weeks powdery mildew will be the main concern in vinifera grapes if rainy weather

predominates. Powdery mildew will release spores if we get rainfalls of 0.1 inch or more with a minimum temperature of 50 degrees. This is also the time that phomopsis begins to release spores. This disease has not been much of an issue in vinifera production in northern Michigan even though a number of varieties are susceptible. We have seen it most in hybrids and native varieties like Concord and Niagara.

### **Saskatoons**

*Duke Elsner*

Bloom and fruit set proceeded rapidly over the past week. Adult apple curculios and saskatoon sawflies continue to be active in the Traverse City area. The season for egg laying by these insects should be under way, so protection of the fruit is now important at sites that have had problems with these pests. This is also an important time of the season to protect plants from Entomosporium leafspot and saskatoon-juniper rust.

### **Strawberries**

*Duke Elsner*

I have only seen a few sites to this date. Where there was no frost protection, plants suffered quite a bit from the recent freezes.

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## **Leelanau County Health Department scheduling respirator fit tests**

The Leelanau County Health Department will be on hand for respirator fit tests after the June 6, 2017 Leelanau County IPM Update, at Jan and Jim Bardenhagen's farm.

There is limited availability for the June 6<sup>th</sup> fit tests, as the health department only has the ability to accept 9 people at a time. Additional requests will be put on a 'to be scheduled' list, and will more than likely be scheduled for after another Leelanau County IPM Update.

Cost for the fit test is \$35/person.

If you are interested in signing up to receive the fit test, please contact Jenn at the research center, at [goodr100@msu.edu](mailto:goodr100@msu.edu) or 231-946-1510, and she will send over paperwork to be filled out before the fit test. People will be given a time slot for the June 6, 2017 fit tests on a first come, first serve basis.

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## **Widespread Detections of San Jose Scale in NW Michigan Tree Fruit Crops**



*Growers are reporting increased damage from San Jose scale this spring, and this article provides life cycle information and control strategies*

**Nikki Rothwell and Emily Pochubay, NW MI Horticultural Research Center  
John Wise, Dept. of Entomology, MSU**

In past seasons, we have observed large populations of San Jose scale (SJS) on sweet cherries in the northwest Michigan, and more recent reports show that this pest is increasing in tree fruit crops in the state. Ten years ago, we were not able to readily identify SJS damage in sweet cherry because sweet cherry branches and tree dieback were masked by ethephon damage due to hot and dry weather prior to harvest. Additionally, SJS had been deemed a key pest of apple trees and fruit and received little attention as a key pest of sweet cherry in Michigan as SJS we have not documented SJS damage to cherry fruit in this state. Prior to the 2007 documentation of SJS damage in sweet cherry trees, this type of SJS epidemic had not been seen in Michigan.

Scales are insects with a unique life cycle that makes them difficult to control. Immature female and male scale overwinter underneath a waxy, turtle-like covering. When sap begins to run in the spring, the overwintering scales grow, and reach maturity in mid- to late May. At this time of the year, male scales come out from under the scale to mate with females. Females give birth to live young rather than laying eggs—these nymphs are the crawler stage of the life cycle. Each female is capable of bearing 150-500 offspring. These crawlers start to suck sap with their needle-like mouthparts, and within three weeks, the crawlers molt and lose their old skins, legs, and antennae to become a flattened sac with waxy caps. They remain attached to the trees with their mouthparts and protective covering. Weather permitting, immature scales will continue to feed, develop, and mature, and depending on location can have two to five generations. In northwest Michigan, there are typically two generations of SJS.

San Jose scale feeds on sap of trees, and on healthy trees, large populations are needed to cause economic injury. Depending on the size of the population, SJS can kill young trees in two to three years. Older trees can also be killed by scale, but they do withstand more feeding damage than young trees. In many cases, we have observed damage in older sweet cherries, and there is considerable die back in the tops of the trees; in these situations, trees are not killed but the cropping potential is considerably reduced. In addition to feeding on bark, San Jose scales can also feed on the fruit and leaves. Feeding on fruit causes bright red spots and is most commonly seen on apple. As mentioned previously, we have not identified SJS feeding injury on sweet cherry fruit in Michigan.

Because these insects typically have two generations per year in our area, we have three optimal timings for control. An oil application during pre-bloom is highly effective for targeting adults by suffocating the overwintering scale. Insecticides applied mid-June and mid-August target crawlers before they produce their protective waxy covering.

Targeting the first generation crawlers will prevent mating and reproduction thereby minimizing the population of the second generation.

We conducted two SJS trials in apple at the MSU Trevor Nichols Research Center in Fennville, MI (Tables 1-2 and 3-4). The results of these trials will show the efficacy of the different scale materials, some of which are new insecticides. Growers can apply these results to sweet cherry as best they are able—unfortunately, we have not conducted replicated SJS efficacy trials in sweet cherries. We intend to initiate these trials in 2018.

All treatments except those with Sivanto-alone provided significant levels of control compared to the untreated check (Table 2). Lorsban, Movento and Centaur treatments provided the highest level of control, but only the Centaur delayed-dormant and pink timings resulted in 100% clean fruit. The EPA re-registered the product, Closer, but only post bloom applications are permitted. As a reminder, review all insecticide labels for additional information on restrictions for application, mixing, etc. From the 2016 data, the Sivanto (1/2 green), Sivanto/Movento and Lorsban treatments all significantly reduced the incidence of SJS injury to fruit (Table 4).

The results from both sets of data show that the tested materials provide good control of SJS in apple. However, results were based on percent damaged fruit and number of scales per fruit; the number of scales or levels of damage to woody tissue were not measured. It is possible that SJS may behave differently on apple and cherry. Hence, we encourage consultants, scouts, and/or growers to trap for males to better predict when crawlers will emerge to best time spray applications. Furthermore, growers should be mindful that these chemistries have different mechanisms for their efficacy against SJS. For example, products such as Lorsban (Note: phytotoxic on sweet cherry foliage and not to be used past petal fall in tart cherry) and those that were not tested but are recommended in the Michigan Fruit Management Guide (ex. Warrior, Assail) are contact poisons that will have the best efficacy against crawlers if the spray material comes in contact with the pest. The newer unique chemistries such as Sivanto and Movento are taken up by plant tissue and have different movement characteristics within the tree tissue. Sivanto displays translaminar movement and is xylem mobile meaning that the spray material will move in the foliage. On the other hand, Movento is phloem and xylem mobile meaning that this chemistry can move from foliage all the way to the tree’s roots. Because the tree takes up these materials, they are most effective against scale when the material is present in the tree prior to substantial feeding. Therefore, these materials should be applied prior to crawler emergence (~roughly two weeks after peak male flight or petal fall timing). Sivanto is not labeled for stone fruits, and Movento is labeled for both pome and stone fruit. Lastly, Table 5 shows the speed of activity of the chemistries on the crawler stage and the potential for the insecticide to flare mites.

Table 1. San Jose scale treatments for the 2013 San Jose scale efficacy trial conducted at the Trevor Nichols Research Center

<u>Treatments</u>			<u>Legend</u>		
Treatment/	Rate	Application	App.	Application	Spray

	Formulation	Product/Acre	Code	Code	Target	Date
1	Untreated			A	Delayed Dormant	30-April
2	LORSBAN 75 WG	1 lb/a	A	B	Tight Cluster	6-May
	Damoil	1 % v/v	A	C	Pink	7-May
3	Closer SC	3 fl oz/a	B	D	Bloom	13-May
	R-11	0.125 % v/v	B	E	Petal Fall	23-May
4	Sivanto 200 SL	14 fl oz/a	B			
	Damoil	1 % v/v	B			
5	Sivanto 200 SL	10.5 fl oz/a	D			
	R-11	0.125 % v/v	D			
6	Sivanto 200 SL	10.5 fl oz/a	B			
	Damoil	1 % v/v	B			
	Movento 240 SC	6 fl oz/a	E			
	R-11	0.25 % v/v	E			
7	Movento 240 SC	9 fl oz/a	E			
	R-11	0.25 % v/v	E			
8	Centaur WDG	46 oz/a	A			
	Damoil	1 % v/v	A			
9	Centaur 40SC	71.5 fl oz/a	A			
	Damoil	1 % v/v	A			
10	Centaur WDG	46 oz/a	C			
	Damoil	1 % v/v	C			
11	Centaur 40SC	71.5 fl oz/a	C			
	Damoil	1 % v/v	C			

Table 2. 2013 San Jose scale efficacy results in apple from Trevor Nichols Research Center

	Treatment/ Formulation	Rate Product/acre	Application Timing	Average # Scales / Fruit 3 Oct <sup>a</sup>	% Fruit Infested 3 Oct <sup>b</sup>
1	Untreated			1.0 ab	16.5 a
2	LORSBAN 75 WG	1 lb/a	A	0.2 cd	2.5 bcd
	Damoil	1 % v/v	A		
3	Closer SC	3 fl oz/a	B	0.6 bcd	6.1 bc
	R-11	0.125 % v/v	B		
4	Sivanto 200 SL	14 fl oz/a	B	0.9 bc	9.0 ab
	Damoil	1 % v/v	B		
5	Sivanto 200 SL	10.5 fl oz/a	D	1.8 a	19.0 a
	R-11	0.125 % v/v	D		
6	Sivanto 200 SL	10.5 fl oz/a	B	0.2 cd	3.5 bcd
	Damoil	1 % v/v	B		
	Movento 240 SC	6 fl oz/a	E		
	R-11	0.25 % v/v	E		
7	Movento 240 SC	9 fl oz/a	E	0.1 cd	1.5 cd
	R-11	0.25 % v/v	E		
8	Centaur WDG	46 oz/a	A	0.0 d	0.0 d
	Damoil	1 % v/v	A		
9	Centaur 40 SC	71.5 fl oz/a	A	0.0 d	1.0 cd
	Damoil	1 % v/v	A		
10	Centaur WDG	46 oz/a	C	0.0 d	0.5 cd
	Damoil	1 % v/v	C		
11	Centaur 40 SC	71.5 fl oz/a	C	0.0 d	0.0 d
	Damoil	1 % v/v	C		

Means followed by same letter do not significantly differ ( $P=0.05$ , Duncan's New MRT)

<sup>a</sup> ANOVA performed on square-root transformed data; data presented are actual counts

<sup>b</sup> ANOVA performed on arcsine square-root transformed data; data presented are actual counts

Table 3. San Jose scale treatments for the 2016 San Jose scale efficacy trial conducted at the Trevor Nichols Research Center

<u>Treatments</u>			<u>Legend</u>		
Treatment/ Formulation	Rate Product/ acre	Appl. Timing	Appl. Code	Appl. Target	Appl. Date
1 Untreated Check			A	Half inch green	19-Apr
2 Sivanto Prime SL	14 fl oz/a	A	B	pink	26-Apr
Damoil 90 EC	1 % v/v	A	C	petal fall	19-May
3 Sivanto Prime SL	14 fl oz/a	B	D	1C(CM bio+250DD)	8-Jun
R-11 90 EC	0.125 % v/v	B			
4 Movento 240 SC	9 fl oz/a	C			
R-11 90 EC	0.250 % v/v	C			
5 Sivanto Prime SL	14 fl oz/a	B			
R-11 90 EC	0.125 % v/v	B			
Movento 240 SC	9 fl oz/a	D			
R-11 90 EC	0.250 % v/v	D			
6 Lorsban Advanced EW	64 fl oz/a	A			
Damoil 90 EC	1 % v/v	A			

Table 4. 2013 San Jose scale efficacy results in apple from Trevor Nichols Research Center

Treatment/ Formulation	Rate Product/ acre	Appl. Timing	San Jose Scale % damaged fruit 6/20/2016
1 Untreated Check			7.3 a
2 Sivanto Prime SL	14 fl oz/a	A	1.3 b
Damoil 90 EC	1 % v/v	A	
3 Sivanto Prime SL	14 fl oz/a	B	3.3 ab
R-11 90 EC	0.125 % v/v	B	
4 Movento 240 SC	9 fl oz/a	C	2.5 ab
R-11 90 EC	0.250 % v/v	C	
5 Sivanto Prime SL	14 fl oz/a	B	1.5 b
R-11 90 EC	0.125 % v/v	B	
Movento 240 SC	9 fl oz/a	D	
R-11 90 EC	0.250 % v/v	D	
6 Lorsban Advanced EW	64 fl oz/a	A	1.8 b
Damoil 90 EC	1 % v/v	A	

Means followed by same letter do not significantly differ ( $P=0.05$ , Tukey's HSD) ANOVA performed on square-root transformed data; data presented are actual counts

Table 5. Insecticidal Activity on crawler stage of Scale insects

Compound	Labeled Crops	Speed of Activity	Mite flaring
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			<b>potential</b>
Esteem	All fruits	slow	low
Movento	Pome and stone fruits	slow	low
Warrior/Asana	Pome fruit (not on stone fruit label)	fast	high
Assail*	Pome and stone fruits (not on blueberry label)	moderate	moderate
Sivanto	Pome fruits (not on blueberry label)	moderate	low
Closer*	Pome and stone fruits	moderate	low
Centaur	Pome and stone fruits	slow	low

\* suppression only.

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## Effectively controlling plum curculio in stone and pome fruits

*Growers have many options for plum curculio control, but all have different modes of action.*

Posted by [John Wise](#), Michigan State University Extension, Department of Entomology; Nikki Rothwell, MSU Extension; and Mark Whalon, MSU Extension, Department of Entomology, MSUE News

With stone fruits at shuck-split and apples sizing, and the warm temperatures predicted for this week, plum curculio is likely to begin egg-laying in fruit. There are many insecticides available for controlling plum curculio, but their performance characteristics vary greatly compared to our traditional broad-spectrum chemistries. These conventional insecticides, such as organophosphates and pyrethroids, work primarily as lethal contact

poisons on plum curculio adults in the tree canopy. Avaunt also works primarily by lethal activity, but ingestion is the important means for delivering the poison.

Neonicotinoids are highly lethal to plum curculio via contact for the first several days after application, but as these systemic compounds move into plant tissue, they protect fruit from plum curculio injury via their oviposition (egg-laying) deterrence and anti-feedant modes of activity. Neonicotinoids and organophosphates can also be used as rescue treatments because they have a curative action that can kill eggs and larvae that are already present in the fruit.

Voliam flexi can be used for plum curculio control, but only the neonicotinoid (Actara) component will be effective against plum curculio. Also, 4.5 to 5.5 ounces of Actara is the recommended rate for plum curculio control, and Voliam flexi is labeled at 4-7 ounces; be sure to apply an adequate amount of Voliam flexi to meet these recommended rates. Leverage (imidacloprid plus cyfluthrin) and Voliam Xpress (Chlorantraniliprole plus Lambda-cyhalothrin) are other pre-mix materials labeled for plum curculio control. For organic growers, Venerate has been shown to provide good control.

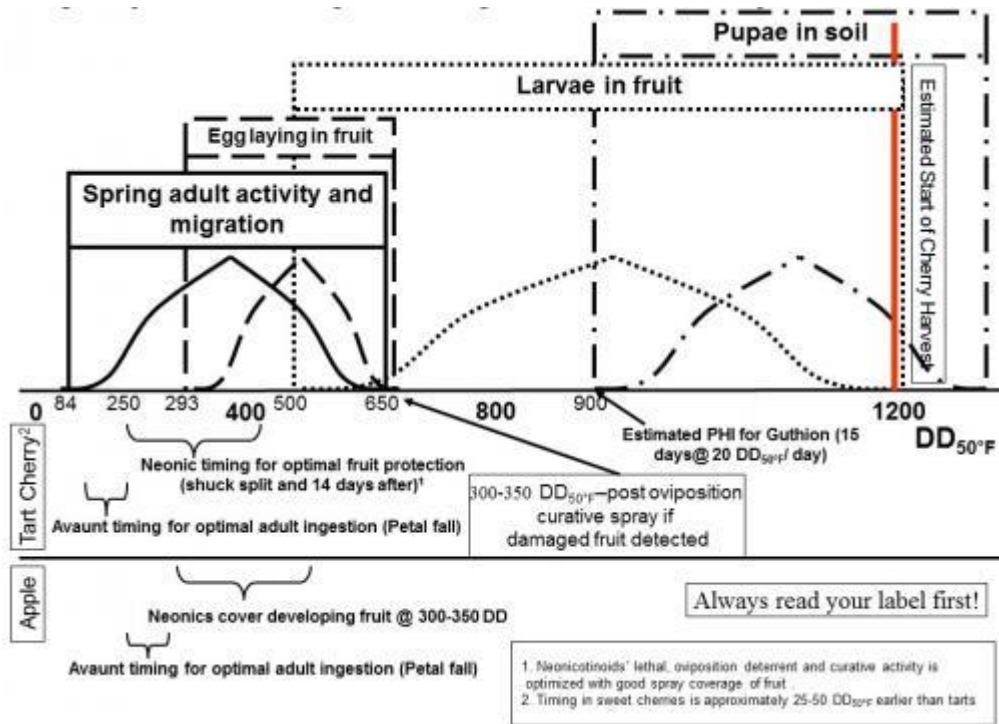
The table below is designed to summarize several key variables that can help growers determine how to optimize the performance of various insecticides for integrated pest management (IPM) programs. Several other compounds, like Exirel, Rimon, Esteem and Delegate, are commonly used in tree fruit pest management programs and have activity on plum curculio worth noting.

Rimon, when targeted to control obliquebanded leafroller or codling moth at petal fall, will effectively sterilize plum curculio eggs when adults are exposed to residues in the tree canopy. These sub-lethal effects will not prevent injury to fruit from adults, but will result in nonviable plum curculio eggs, thus no live larvae. Delegate and Exirel have been shown to provide fair to good activity, but ingestion by plum curculio adults is important for control. Esteem, when used approximately two weeks post-harvest in cherries (San Jose scale crawler timing) will reduce female plum curculio overwintering viability. However, Rimon, Esteem and Delegate are **not** labeled for stand-alone plum curculio control, but when used in pest management programs may contribute to overall plum curculio population management.

Optimal timing and order selection of insecticides for plum curculio management is based on matching the performance characteristics of each compound with plum curculio life-cycle development (see photo) and tree phenology (see table). Because organophosphates and pyrethroid insecticides are contact poisons, they can be used as early as petal fall to knock beetles out of the tree canopy. However, [Michigan State University Extension](#) cautions using pyrethroids as they are toxic to mite predators. Plum curculio adults feed on tree parts during bloom and petal fall, so Avaunt can be used at this petal fall timing.

The performance of neonicotinoids is optimized when sprays are made after fruit set (pome fruits) or shuck-split (stone fruits), so that fruit and foliage are both covered.

Surround will not work unless the tree and fruit are completely covered, so multiple sprays are needed on the tree prior to plum curculio oviposition activity. If plum curculio infestation occurs and a rescue treatment is needed, organophosphates and neonicotinoids can provide curative action up to two weeks after plum curculio infestation, although in some cases dead cadavers can still be found in fruit.



Plum curculio life stage control timing for reduced risk and OP-replacement insecticides.

Insecticidal modes of activity on plum curculio life stages				
Compounds <sup>2</sup>	Chemical class / activity	Crop	Rate	Crop stage and initial control timing (DD <sub>50</sub> )
Imidan 70W**	Organophosphate	Pome fruit	3 pounds	Petal fall (approx. 250 DD)
	Lethal via contact	Stone fruit	2.125 pounds	Petal fall (approx. 175 DD)
Actara 25WG**	Neonicotinoid	Pome fruit	4.5 ounces	Petal fall + 3-5 days (approx. 300 DD)
	Lethal, Antifeedant and Curative	Stone fruit	4.5 ounces	Shuck-off (approx. 250 DD)
Assail 30SG**	Neonicotinoid	Pome fruit	6 ounces	Petal fall + 3-5 days (approx. 300 DD)
	Lethal, Antifeedant and Curative	Stone fruit	—	Shuck-off (approx. 250 DD)
Belay 2.13SC**	Neonicotinoid	Pome fruit	6 ounces	Petal fall + 3-5 days (approx. 300 DD)
	Lethal, Antifeedant	Peach	—	Shuck-off (approx. 250 DD)

	and Curative			
Exirel 10SE	Diamide	Pome fruit	6 ounces	Petal fall (approx. 250 DD)
	Lethal via ingestion	Stone fruit		Petal fall (approx. 175 DD)
Delegate 25WG*	Spinosyn	Pome fruit	6 ounces	Petal fall (approx. 250 DD)
	Lethal via ingestion	Stone fruit <sup>1</sup>		Petal fall (approx. 175 DD)
Avaunt 30WG	Oxadiazine	Pome fruit	5 ounces	Petal fall (approx. 250 DD)
	Lethal via ingestion	Stone fruit		Petal fall (approx. 175 DD)
Venerate XC	Biopesticide	Pome & stone fruits	4-8 quarts	Petal fall (approx. 250 DD)
Pyrethroids	Asana, Warrior, Baythroid	Pome fruit Stone fruit	Variable	Petal fall (approx. 250 DD)
	Lethal, repellent			Petal fall (approx. 175 DD)
Rimon* (targeting codling moth, obliquebanded leafroller)	IGR	Pome fruit	20-40 ounces	Petal fall (approx. 250 DD)
	Egg sterilization	Stone fruit		
Esteem* (targeting scale)	IGR	Pome fruit	5 ounces	Post-harvest
	Adult sterilization	Stone fruit		
Leverage 2.7F	Pyrethroid + Neonicotinoid	Pome fruit	4.4-5.1 ounces	Petal fall (approx. 250 DD)
	Lethal, Repellent, Curative	Stone fruit	4.5-5.1 ounces	Shuck-off (approx. 250 DD)
Voliam Xpress	Pyrethroid + Diamide	Pome fruit	6-12 ounces	Petal fall (approx. 250 DD)
	Lethal, Repellent	Stone fruit	6-12 ounces	Petal fall (approx. 175 DD)
Voliam flexi	Neonicotinoid + Diamide	Pome fruit	6-7 ounces	Petal fall (approx. 250 DD)
	Lethal, Antifeedant, Curative	Stone fruit	6-7 ounces	Shuck-off (approx. 250 DD)

\*Not labeled for plum curculio (or just for PC suppression)

\*\*Have curative properties that can kill eggs and larvae that are already present in the fruit.

*Modified from John Wise, Nikki Rothwell, David Epstein, Larry Gut, and Mark Whalon, 2009.*

*Drs. Wise and Rothwell's work is funded in part by [MSU's AgBioResearch](#).*

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## Black stem borer management in spring



*The time to manage black stem borer is in spring when females are colonizing new trees. A few adults have been active since late April and we anticipate flight will surge as it warms up in May.*

Posted by [Larry Gut](#), and Mike Haas, Michigan State University Extension, Department of Entomology, MSUE News

Incidents of black stem borer injury to young apple orchards are on the rise in Michigan. Adults are attracted to stressed trees although they have been known to infest trees that do not appear to be stressed. Young trees near the perimeter of orchards, especially near woodlots, are at greatest risk of injury. Signs of infestation include 1 millimeter diameter entrance holes, sawdust “toothpicks” protruding from the holes, dark discoloration on the bark, oozing sap and dry, blistered bark.

The time to manage this insect is during the spring flight when females are searching for new trees to attack, wanting to establish brood chambers for egg laying and raising her young. Once they enter the tree, they are out of reach for pesticide applications, so timely control measures are essential.

We placed traps in several infested sites in late March and captured the first adults in southwest Michigan during a warm spell in late April. Catches have been low since that initial burst of activity. Peak catch in the past two years has occurred in mid- to late May. We anticipate the same timing this year with adult flight surging as it warms up in May. This will be the optimum time to apply an insecticide.

There are a limited number of insecticides available for borer control. During the past two years, we conducted chemical efficacy trials with several borer insecticides in search of information growers could use to make effective control decisions. Unfortunately, what studies like ours, and similar trials in other states, have shown is that the effectiveness of borer control in apple orchards is highly variable.

The materials we tested did not perform significantly different from each other, or an untreated water-only control, when compared statistically, but there were some general trends. In 2015, we made trunk drench applications to trees in two commercial orchards, comparing lambda-cyhalothrin (Warrior without Zeon Technology) at 5.12 ounces per acre and zeta-cypermethrin (Mustang Maxx) at 4 ounces per acre. The results from this trial showed that Warrior insecticide had fewer entry holes.

Last year in 2016 we used apple wood loglets treated with each material and baited with ethanol to attract beetles. Loglets were placed in woodlots on edges of infested orchards, and the number of entry holes created by black stem borer were counted over time. Also in 2016 we applied insecticides using two methods: as a trunk drench or as an airblast spray. The loglets treated with the two chemicals from the previous year along with 10 ounces acre of permethrin and 12.8 ounces acre of bifenthrin. The bifenthrin and permethrin-treated loglets had the fewest cumulative entry holes in the two runs of the test conducted in 2016.

In addition to chemical treatment, growers who remove black stem borer-infested trees should destroy them, preferably by burning, immediately.

*Dr. Gut's work is funded in part by [MSU's AqBioResearch](#).*

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## **IPM Updates and May 23<sup>rd</sup> and 24<sup>th</sup> IPM Updates**

### **May 23<sup>rd</sup> and 24<sup>th</sup>:**

The following week, Gillison' Variety Fabrication will be on hand during IPM Updates to demo their new GB-34R 500 Narrow Variable Air Orchard Sprayer. Below are the dates and locations of the demos.

May 23, 2017 – Jan and Jim Bardenhagen's Farm, 12PM – 2PM

May 24 – Jack Whites Farm, 10AM – 12PM

May 24 – Blaine Church, 2PM – 4PM

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## **Forecasted weather is a concern for fire blight during bloom**

*Following severe fire blight conditions and widespread infections last season, apple and pear growers should be prepared to manage fire blight.*

Emily Pochubay, Nikki Rothwell, and George Sundin, MSU Extension

Last season's bloom time conditions were optimal for fire blight development in northwest Michigan, and as a result many apple orchards had some level of fire blight infection. We also had many orchards that had moderate to severe levels of infection. In 2016, warm temperatures during bloom were ideal for the growth of fire blight bacteria on flower pistils. Sunny, warm, and relatively calm conditions were favorable for pollinator activity, and pollinators readily spread the fire blight bacteria to open blossoms.

Although growers maintained good fire blight management programs, conditions were so ideal that the bacteria were able to grow rapidly, which compromised fire blight management strategies. Warm weather was followed by rain that washed the bacteria into flower nectaries and initiated infection. The region also had windy conditions that contributed to trauma blight. Infected shoots collapsed (resembling a Shepherd's crook), and these shoots produced bacteria containing ooze that continued to pose

management challenges for several weeks after bloom. In orchards with moderate to high levels of fire blight symptoms, growers removed infected shoots and in some cases used Apogee or copper programs to minimize the spread and severity of shoot infection. Despite last season's management efforts, there is the potential for a high level of inoculum in orchards that were infected with fire blight last season. Furthermore, temperatures in the 70s and 80s are forecasted for this week, which will be ideal for rapid growth of the fire blight bacteria in orchards with open blossoms. These predicted warm temperatures will be coupled with rain/possible thunderstorms, which will be a serious concern for flower infection and possibly trauma blight. Forecasted conditions are highly conducive for significant fire blight infection.

Growers that will have orchards in bloom this week are encouraged to frequently monitor the Epiphytic Infection Potential (EIP) values on Enviroweather's Fire Blight of Apple Blossoms model, and growers should keep in mind that these values can change quickly when the forecast changes. The EIP value is an estimator of the risk of blossom blight infection based on predicted weather conditions. As of 15 May at 10:00 AM, the model is predicting EIPs nearing 200 for the Northwest Michigan Horticultural Research Center; an EIP value greater than 200 is considered a very high infection risk with epidemic potential. On the model output, red boxes appear on EIP values above 100 and in most situations, the red boxes indicate that management should be taken to prevent and minimize infection. However, this season we suggest that growers take action at an EIP value of 80+ in orchards that were impacted by fire blight last season. Additionally, an Apogee program should be used in orchards that had moderate to high levels of infection last season to further minimize the potential impact of fire blight this season. Please refer to Dr. George Sundin's article, *A primer for Streptomycin, Kasumin, and Oxytetracycline use for fire blight management*, for additional management information. At this time, the station is at king bloom meaning that not many flowers have opened or will be open during the warm temperatures early in the week. As a result we are fortunate there has been little opportunity for fire blight bacteria to grow during this early timing of bloom. However, other areas have orchards with 50% or more open blossoms and the bacteria have had more time to develop making the concern for fire blight greater in these orchards. Temperatures are currently predicted to cool down by the end of the week, which will reduce the risk of fire blight later in the week for newly opening blossoms. Again, we encourage growers to continue to monitor the EIP values as more blossoms open and we approach full bloom.

### **Apogee Strategy**

Apogee is a growth inhibitor that provides excellent control of shoot blight by making shoots less susceptible to infection through shoot growth inhibition. The first timing for an Apogee spray is at king bloom petal fall followed by two or sometimes three additional applications at two week intervals. The king bloom petal fall timing for the first application coincides with the beginning period of rapid shoot growth of the tree, and this timing is critically important for a good response from Apogee. If shoot growth exceeds 3", Apogee will not work as well. An Apogee program of three applications at a rate of 8 oz/A at two week intervals beginning at king bloom petal fall is suggested. However, some growers have used an alternative strategy with a higher rate for the first

application of Apogee followed by a reduced rate for the second and third applications (ex. 12 oz/A for 1<sup>st</sup> application followed by 6 oz/A for second and third applications. As a reminder, Apogee must be used with an organosilicone surfactant, and in hard water (i.e. high levels of calcium carbonate), an equal weight of spray grade ammonium sulfate should be used per lb of Apogee. For more information on Apogee, please refer to the Michigan Fruit Management Guide (pages 108 and 259) and the article, *Apogee Application Time*.

### **Managing Fire Blight with Apogee in Frost/Freeze Damaged Orchards**

In orchards that were damaged due to freezing temperatures last week, growers may still need to implement a fire blight management strategy under the forecasted conditions. Even in severely devastated orchards, some bloom may remain viable and is a concern for fire blight. Trees with few viable flowers will result in little fruit meaning that these trees will be very vigorous, putting energy into vegetative growth. If these trees have a few viable flowers that become infected with fire blight, the bacteria will be able to spread quickly as these trees grow. In these orchards, a straight Apogee program of three applications spread two weeks apart will not stop the bacteria from infecting flowers, but it will help prevent shoot blight symptoms as the trees grow.

### **Streptomycin Resistance Screening Update**

The NWMHRC's and Dr. Sundin's labs sampled many orchards for streptomycin resistant strains of fire blight bacteria last season, and we have continued to find widespread resistance in northwest Michigan with a new detection in Manistee County last year. Growers located in areas with known resistance should use Kasumin as an alternative for fire blight management this season. If growers are planning to use streptomycin and resistance is unknown, one strategy that could help to lessen the risk of an ineffective application is to incorporate oxytetracycline into the strep spray. Use full rates of both of the antibiotics in the tank mix. Oxytetracycline does not kill the bacteria, but it will inhibit bacterial growth, which will help to minimize the risk of infection if a streptomycin application is not effective against fire blight.

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## **A primer for Streptomycin, Kasumin, and Oxytetracycline use for fire blight management**

**Streptomycin, Kasumin and oxytetracycline are registered for bloom blight control on pome fruit. Informational summaries and use patterns are explained.**

Posted by [George Sundin](#), Michigan State University Extension, Department of Plant, Soil, and Microbial Sciences, MSUE News

The apple or pear flower is a critical site for multiplication of the fire blight pathogen *Erwinia amylovora*. When temperatures are conducive for growth (70s to low 80s optimal), *E. amylovora* populations can grow to one million cells per flower within one to two days. As these populations grow, remember they will also be very quickly

disseminated among flowers by pollinators. Thus, warm and sunny days during bloom can very quickly lead to high percentages of flowers colonized with incredibly large fire blight populations.

The fire blight pathogen only grows well on flower stigmas, not on other flower parts. These bacteria do not need rain to grow on the stigma. They do, however, require free moisture, as little as 0.01 inch rain, to move from the stigma tip down the outside of the style to the base of the flower where infection occurs through the nectaries. Blossom blight infection can really kick start a fire blight epidemic because these infected flower clusters will ooze more inoculum out and bacteria will be spreading internally through the tree.

With the [full registration of Kasumin](#) by the [Environmental Protection Agency](#) (EPA) last fall, we now have three antibiotics available for fire blight management during bloom. Below is information about these antibiotics and suggestions for best use. These suggestions will differ based on the occurrence of streptomycin resistance in the fire blight pathogen in your orchard or region.

### **Streptomycin**

Streptomycin is an **excellent** fire blight material and provides forward control for two to four days prior to rain events and will be effective for blossom blight control if applied within 12-24 hours after a rain event. Streptomycin is used at a rate of 24 ounces per acre and should be applied with a non-ionic surfactant such as Regulaid (1 pint per 100 gallons). The use of the surfactant enhances deposition of the antibiotic on flowers and increases the chances that the critical stigma targets will be hit.

Note: If streptomycin is reapplied within three to four days after a previous application, Regulaid can be omitted to avoid phytotoxicity – usually viewed as yellowing of leaf margins. Streptomycin is partially systemic and can reach fire blight bacteria that have entered flower nectaries.

### **Kasumin**

Kasugamycin is an antibiotic related to streptomycin. There is no cross-resistance between Kasumin and streptomycin as Kasumin controls streptomycin-resistant strains of *E. amylovora*.

Kasumin is an **excellent** fire blight material and provides forward control for two to four days prior to rain events and will be effective for blossom blight control if applied within 12 hours after a rain event. Kasumin is used at a rate of 2 quarts (64 fluid ounces) per acre in 100 gallons of water per acre and should be applied with a non-ionic surfactant such as Regulaid (1 pint per 100 gallons). Read the Kasumin label carefully as there are some specifications, including:

- Do not apply Kasumin in orchards in which the soil has been fertilized with animal manure.
- Do not apply after petal fall.
- Do not use alternate row applications.

The main difference between Kasumin and streptomycin is that Kasumin is not partially systemic like streptomycin is. Thus, Kasumin will not penetrate into the nectaries and will not be able to control an infection once the fire blight pathogen reaches the nectaries.

## **Oxytetracycline**

Oxytetracycline is a **good** fire blight material and should be applied within one day prior to a rain event for best results. Oxytetracycline is bacteriostatic and does not kill fire blight bacteria, it only inhibits their growth. Thus, it has to be applied prior to rains where it can prevent growth on stigmas, but it can't eliminate existing populations.

Oxytetracycline is also highly sensitive to degradation by sunlight and much of the activity is lost within one to two days after application. Oxytetracycline is best used as a 200 ppm solution (1 pound per 100 gallons) and should be applied with a non-ionic surfactant such as Regulaid (1 pint per 100 gallons). Per the label, a maximum of 1.5 pounds per acre can be applied, using 150 gallons water in this case.

Two slightly different formulations of oxytetracycline are sold: Mycoshield (OxyTc-calcium complex) and FireLine (OxyTc-hydrochloride). The FireLine formulation is a bit more soluble than Mycoshield and has performed slightly better for blossom blight control in head-to-head comparisons.

## **Antibiotic use for blossom blight management**

Fire blight predictive models such as MaryBlyt or Cougar Blight should be used as guides for timing management decisions. The output of the MaryBlyt model, for example, is the epiphytic infection potential (EIP) number, which is an estimator of the risk of blossom blight infection. The higher the number, the larger the infection risk. I would place forecasted EIP numbers into four categories of risk:

1. Low to moderate ( $50 < \text{EIP} < 75$ )
2. Moderate to high ( $75 < \text{EIP} < 100$ )
3. High ( $\text{EIP} > 100$ )
4. Epidemic potential ( $\text{EIP} > 200$ )

**When the infection risk is moderate to high, high or of epidemic potential, only streptomycin or Kasumin can be expected to provide adequate blossom blight control.** These two antibiotics provide the best blossom blight control and also reduce or eliminate most of the fire blight inoculum from flowers. During these types of high-risk conditions, the spray interval for streptomycin or Kasumin is usually predicated by the occurrence of rainfall. Very high EIPs (greater 200) also necessitate additional antibiotic applications at shorter intervals. Finally, remember the overall risk increases as bloom

progresses as the fire blight pathogen is building up populations on flowers over time. In addition, the more open flowers there are increases fire blight risk, provides more sites for pathogen growth and increases the number of unprotected flowers (flowers opening since the last spray).

Firstly, when the EIP is high (greater than 100) but conditions are dry for several days, remember inoculum is building up rapidly on flower stigmas. Growers should apply streptomycin or Kasumin strategically in the middle of a period such as this to reduce inoculum potential. The outcome of enabling several days of population buildup by doing nothing will make blossom blight much more difficult to control if rain events follow. Controlling diseases under high inoculum situations is always more difficult than controlling diseases in a lower inoculum situation.

When the EIP is high and rain events are forecasted, the application of streptomycin or Kasumin would be best about 24 hours before the rain event and then followed up about one to two days after the rain event. Subsequent spray applications will be based on current and future conditions. For example, if temperatures cool significantly and EIPs are reduced to low to moderate risk values, sprays can be held off. If EIPs remain high, a third application should be made within two to four days based on the occurrence of wet or dry conditions.

**Oxytetracycline is best used when the infection risk is low to moderate (EIP less than 75).** Under warmer conditions when *E. amylovora* is capable of very rapid growth on flower stigmas, oxytetracycline can be overwhelmed by the pathogen and fail to provide adequate control. In addition, the incidence of shoot blight infection is typically higher in oxytetracycline-treated trees compared to streptomycin- or Kasumin-treated trees because the innate activity of this antibiotic is the lowest of the three and its effect on inoculum reduction is the lowest.

**In the absence of streptomycin resistance**, streptomycin is the best choice for fire blight management. While the effectiveness of streptomycin and Kasumin are essentially equivalent in the inoculated blossom blight control tests that I have conducted over a seven-year period, the partial systemic nature of streptomycin gives it an advantage in that it can reach internal populations of *E. amylovora* that Kasumin cannot. Streptomycin is also significantly cheaper than Kasumin. Long-term evidence from around the Midwest and eastern United States suggests that if streptomycin use is limited to a maximum of three to four applications per season, and only used during the bloom period, then the chances of streptomycin resistance development are very low.

The main risk factor for streptomycin resistance development is an increased number of applications per season above four and regular use during the summer for shoot blight control. This use pattern increases the chances of mutation of the fire blight pathogen to streptomycin resistance or acquisition of a streptomycin-resistance gene from the indigenous microflora in orchards.

A resistance management strategy for streptomycin can be used; the best strategy would be to alternate applications of streptomycin and Kasumin. [Michigan State University Extension](#) advises that a tank-mix strategy of using streptomycin and oxytetracycline is not a resistance management strategy. Since the oxytetracycline is not killing bacterial cells, it would not kill any streptomycin-resistant cells that might arise; it would only temporarily prevent their growth.

**In streptomycin-resistance situations**, Kasumin is the antibiotic of choice and is best used in advance of moderate to high risk conditions. This is because where we have detected streptomycin resistance in orchards in Michigan, the incidence of resistant bacterial pathogen strains is usually very high to 100 percent. Thus, streptomycin should not be used in these situations because it will have no effect on the pathogen. If the disease risk is low to moderate, oxytetracycline is also an effective substitute for streptomycin in orchards where streptomycin resistance occurs.

### **Summary of antibiotic use for fire blight management**

The target of antibiotic sprays for fire blight control is the stigma surface, style and base of the flower. Adding a non-ionic surfactant such as Regulaid to antibiotic sprays increases the chances of deposition on target surfaces. The best timing for all antibiotics is to arrive prior to the arrival of fire blight bacteria because these arriving populations are typically small and can be readily controlled if the antibiotic is already present. However, streptomycin and Kasumin can be used effectively after *E. amylovora* cells have arrived and started growing on stigmas.

When EIPs predict potential high risk to epidemic conditions, only streptomycin or Kasumin will be effective for blossom blight control. Under these conditions, the two most important considerations are very tight spray intervals and excellent spray coverage.

*Dr. Sundin's work is funded in part by [MSU's AqBioResearch](#).*

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## **Clarifications on Worker Protection Standards: Central Posting for Pesticide Application Information versus Decontamination Station Requirements for Agricultural Workers**

Eric McCumber, MDARD

Emily Pochubay and Nikki Rothwell, MSU Extension

Both MDARD and MSU have received recent questions about the requirements to display pesticide application information at a central posting area. Growers also have questions



about what should be included at designated decontamination stations. This article is intended to clarify such questions because we have heard misinformation that pesticide application information should be posted within a ¼ mile of where agricultural workers are working in a treated block—this type of posting is *not* required to meet WPS regulations. This confusion may be related to regulations for decontamination stations; according to WPS, **decontamination stations** are required with ¼ mile from where agricultural workers will be working during the REI or for 30 days thereafter of the application of a WPS-labeled pesticide. Although we will cover the key points for these two issues in this article, more detailed information can be found in the How To Comply Manual (HTCM) at [www.pesticideresources.org](http://www.pesticideresources.org). In the HTCM, central posting location information is on page 21 and decontamination station information can be found on page 48. The information presented below is relevant to agricultural employers of agricultural workers. Supplies needed for handlers' decontamination sites are different and we encourage employers and handlers to review this information as needed (page 74-75 of the HTCM).

### Central Posting

**Central posting locations** serve as the hub for pesticide application information, and this central posting location is the *only* location on the farm that is required to contain the information outlined below. *According to MDARD, central posting locations* are areas where all farm employees can find any information related to pesticide applications. If a WPS-labeled pesticide has been applied, or if a restricted-entry interval (REI) has been in effect within the past 30 days, then the agricultural employer must display the required information (see below) at a central posting location whenever any agricultural worker is on the agricultural establishment. The location of the central posting is determined by the agricultural employer, but it should be placed in a location where employees congregate such as the workshop, office, break room, or an area where they check in for work. Agricultural workers must be informed where the designated central posting location is located and must be allowed unrestricted access to the posted information during employment hours.

Agricultural producers are required to display at the central posting area the following information. Again, agricultural workers must have unimpeded access to the information during work hours.

- **Pesticide application information including:**
  - ✓ Brand name of the pesticide(s) applied.
  - ✓ Active ingredient(s).
  - ✓ EPA Reg. No.
  - ✓ REI.
  - ✓ Crop/site treated.
  - ✓ Location and description of treated area(s).
  - ✓ Date(s) and time(s) application started and ended.

- **Safety Data Sheets (SDS)** for each pesticide product.
- **Pesticide Safety Information.** Prior to the updated WPS, this information was required to be displayed in a poster format (known as pesticide safety poster). Agricultural employers are no longer required to display a poster, but must provide information about certain WPS safety concepts-about preventing pesticides from entering the body. The required 7 safety concepts include:
  - ✓ Avoid getting pesticides on your skin or into your body. Pesticides may be on plants, soil, irrigation water, equipment, or may drift from nearby applications.
  - ✓ Wash before eating, drinking, using chewing gum or tobacco, or using the toilet.
  - ✓ Wear work clothing that protects your body from pesticides, such as long-sleeved shirts, long pants, shoes, socks, and a hat or scarf.
  - ✓ Wash or shower with soap and water, shampoo hair and put on clean clothes after work.
  - ✓ Wash work clothes separately from other clothes before wearing them again.
  - ✓ If your body is contaminated by pesticides wash immediately, and as soon as possible, wash or shower with soap and water and change into clean clothing.
  - ✓ Follow directions about keeping out of treated or restricted areas.

In addition, the updated safety information that will be required in the future must include:

- ✓ Instructions for seeking medical attention as soon as possible after being poisoned, injured or made ill by pesticides.
- ✓ Name, address and telephone number of state or tribal pesticide regulatory authority. In Michigan, the agency is the Michigan Department of Agriculture and Rural Development, 525 West Allegan Street, P.O. Box 30017, Lansing, MI. The phone number is 800-292-3939.
- ✓ If pesticides are spilled or sprayed on the body use decontamination supplies to wash immediately, or rinse off in the nearest clean water, including springs, streams, lakes or other sources if more readily available than decontamination supplies, and as soon as possible, wash or shower with soap and water, shampoo hair, and change into clean clothes.
- ✓ Follow directions about keeping out of treated areas and application exclusion zones.
- ✓ The term “emergency medical facility” should be revised to “a nearby operating medical care facility.” Include name, address, and telephone number for the medical facility. This information should be clearly identified as emergency medical contact information on the display.

- ✓ The point that there are federal rules to protect workers and handlers is self-evident and is no longer required to be part of the safety information

**NOTE:** The updated pesticide safety information content is not required until 1/4/18, but employers can begin using the updated version immediately. Details are shown on page 23 of the How To Comply Manual. The EPA is in the process of developing a poster version of the pesticide safety information.

Agricultural producers are only required to have *one central posting area*, but must provide unrestricted access to agricultural workers during work hours. It can be impractical for farms that are many miles apart to give unrestricted access, so agricultural producers may set up different central posting areas for distinctly different farm locations at their discretion. Agricultural employers may also provide the central posting information electronically, as long as content, accessibility, display, legibility, location, and retention requirements are met. Employers would need to ensure that agricultural workers have access to the information, such as through a smart phone or dedicated computer, and are instructed in how to access the information.

#### Decontamination sites

Agricultural employers must make sure that decontamination supplies are provided to workers doing tasks that involved contact with anything that has been treated with the pesticide including soil, water, or plants in a pesticide-treated area where, within the last 30 days, a WPS-labeled pesticide product has been used or a REI for such pesticide has been in effect.

Decontamination supplies that must be provided include:

- ✓ Water – the employer must provide at least 1 gal of water per worker at the beginning of the work period and at a quality and temperature that will not cause injury or illness if it contacts skin or eyes, or is swallowed.
- ✓ An adequate supply of soap and single use towels. Hand sanitizers or wet towelettes *do not* meet the requirement for soap or towels.

#### Duration of the Decontamination Site

If the REI of an applied pesticide is greater than 4 hours, decontamination supplies must be provided until 30 days after the end of the REI expires. If the REI is less than 4 hours, decontamination supplies must be provided until 7 days after the REI expires.

#### Location of Decontamination Sites

All decontamination supplies for agricultural workers must be located together and be reasonably accessible to where the workers are working (generally within ¼ miles of the workers) and be outside of any treated area or an area under a REI. For worker tasks performed more than ¼ mile from the nearest point reachable by vehicles or more than

¼ mile from a non-treated area, the decontamination supplies may be at the nearest vehicular access point outside any treated area or area under REI (page 48 of the HTCM).

Remember that in addition, the Pesticide Safety Information (formerly referred to as the Pesticide Safety Poster) must be displayed at any permanent decontamination site, or any decontamination site that services 11 or more workers (page 21, HTCM).

In summary, central posting locations are the main hub for pesticide application information, and the information that must be displayed at the central posting locations is not required in other agricultural areas (i.e. ¼ mile from workers working in treated fields, or at decontamination stations). It is the responsibility of the employer to train employees on how and where to access the central posting information. Although not required, some growers may choose to provide additional pesticide application information to their workers by having additional posting sites or virtual access to this information. Potable water, and an adequate supply of soap and single use towels, and possibly pesticide safety information (if the decontamination site is a permanent location or services more than 11 workers) must be provided at decontamination

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## **2017 IPM Update Schedule**

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

Tree Fruit IPM Updates beginning the second week of May through June 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. Additionally, we are planning to revisit some of the new Worker Protection Standards as well as host invited speakers from local organizations and MSU at this year's meetings. Workshops will be held weekly in Leelanau, Grand Traverse, Antrim, and Benzie counties. Tree fruit growers and consultants are welcome to attend meetings at any of the locations and times that are most convenient (see below). These workshops are free and do not require registration. Restricted use pesticide applicator recertification credits (2 credits per meeting) and Certified Crop Advisor credits will be available. 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 9, 16, 23; June 6 (tentative), 13, 20, 27

**Time:** 12PM – 2PM

### **Grand Traverse County**

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

**Dates:** May 9, 16, 23; June 6 (tentative), 13, 20, 27

**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 10, 17, 24; June 7 (tentative), 14, 21, 28

**Time:** 10AM – 12PM

### **Benzie County**

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

**Dates:** May 10, 17, 24; June 7 (tentative), 14, 21, 28

**Time:** 2PM – 4PM

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## **Respirator Guidelines to Meet New Worker Protection Standards**

*Growers will need a medical evaluation and respirator fit test to handle and apply some pesticides this season.*

### **Emily Pochubay and Amy Irish-Brown, MSU Extension**

Requirements for a medical evaluation, fit testing, and specific training for use of respirators and the associated record keeping became effective on January 2, 2017. At this time, most growers are aware of this revision to the Worker Protection Standard (WPS) regulation that requires pesticide handlers and applicators to wear a respirator during mixing/handling, spray applications, and potential other uses as outlined on pesticide labels. Additionally, those who use pesticides with respirator requirements must receive documentation from a physician or licensed health care professional (PLHCP) that has ‘respirator evaluation’ as part of his/her license to ensure that the pesticide handler is medically able to use a respirator. Not all PLHCPs are qualified to provide the respirator evaluation, but primary care physicians should be able to refer patients to appropriate medical personnel. Alternatively, growers can contact local occupation and environmental health professionals who are more likely to have the credentials needed to provide the appropriate respirator medical evaluation and documentation. Please review the following guidelines to help address some of the recent questions we have received from growers.

### **Who needs to receive a medical evaluation and how often?**

Employees that could be exposed to hazardous airborne contaminants may be required to wear a respirator; respirators and respirator use requirements will be outlined on individual pesticide labels. Some pesticides may require respirators for employees that mix spray material and/or require applicators to wear a respirator during applications of certain pesticides. Employers are responsible for ensuring that employees receive the appropriate equipment, evaluation, respirator fit test, training, and record keeping that conforms to OSHA standards.

According to the EPA, the medical evaluation is required one time per employee unless another evaluation is required due to one of the following reasons:

- The medical determination is only good for a specified length of time.
- The employee reports medical signs or symptoms related to respirator use.
- The PLHCP, supervisor, or program administrator recommends a re-evaluation.
- Fit-test or other program information indicates a need for re-evaluation.
- When changes in the workplace increase respirator stress on an employee.
- The initial medical examination demonstrates the need for a follow-up medical examination.

#### **Who provides the evaluation? What kind of evaluation and documentation are needed?**

A physician or licensed health care professional (PLHCP) with respirator evaluation as part of their license will provide the appropriate evaluation using a medical questionnaire or exam that conforms to the OSHA standard. Contact the PLHCP to determine whether a questionnaire or exam will be used and to receive appropriate paperwork. Prior to completing the questionnaire or exam, employers must provide employees with:

- The type and weight of the respirator that the handler will use.
- How long and how frequently the handler will use the respirator.
- How much physical work the handler will do while using the respirator.
- Other PPE the handler will use.
- The temperature and humidity extremes of the working environment.

Contact a primary care physician to receive a referral for a licensed professional, if necessary. Another low-cost (~\$25) and fast alternative for a medical evaluation is OshaMedCert ( <http://www.oshamedcert.com/Default.aspx>), an online service that involves filling out a form and sending it for approval or denial by a PLHCP; individual's health information remains confidential throughout the process. A respirator fit test (see below) will be needed after receiving the medical determination from OshaMedCert.

A written medical determination of the respirator evaluation for each employee is required before the employee can use the respirator. The employer must keep the medical determination documentation for two years. According to the EPA, the required written information to be provided by the PLHCP to the employer must only include:

- Whether or not the employee is medically able to use a respirator.

- Any limitations on respirator use in relation to the medical conditions (if any) of the employee or workplace conditions.
- Need for any follow-up medical evaluations.
- A statement that PLCHP provided the employee with written recommendation; in some cases, this recommendations may simply state that the applicator/person that will use the respirator is capable of wearing a respirator.

Again, the information outlined above is the *only* information that should be provided in the PLHCP's recommendation to the employer to protect the employee's private medical information and avoid violation of HIPAA laws.

### **What's Next? Respirator Fit Tests.**

After receiving a medical evaluation, a fit test is needed to ensure that the respirator forms an adequate seal with an employee's face to provide appropriate inhalation exposure protection. A new fit test is required annually or whenever there is a change to the respirator or a physiological change to the employee that could affect the seal between the respirator and the user's face. Furthermore, fit tests are required for each type of respirator that will be used as indicated by pesticide labels. Finally, employees must undergo the fit test using a respirator with the exact specifications of the respirator that will be used on the job.

Fit tests must follow OSHA protocols, and there are two methods for fit testing. The quantitative fit test (QNFT) requires special equipment and a trained person to conduct the testing. Fit test kits are also available to perform qualitative fit tests (QLFT) by a person that can accurately prepare test solutions, calibrate equipment, perform the test properly, recognize invalid tests and ensure test equipment is working properly. Sources for fit tests include pesticide suppliers or companies such as [Gempler's](#) or [Grainger](#).

A primary care physician may be able to provide additional options and referrals for fit test providers in the area. We confirmed that Munson Medical Center's Occupational Health and Medicine Clinic (550 Munson Ave. Traverse City, MI 49686; Ph: 231-935-8590) is equipped to perform the appropriate respirator exam (~\$80.00) and the fit test (~\$25.00) in one visit by appointment only. Spectrum Health Services in other areas of Michigan provide similar services. Patients that wish to only receive a fit test need to provide appropriate respirator exam result documentation prior to the test.

Additional information regarding respirator requirements and other WPS revisions can be found in the EPA's *How to Comply with the 2015 Revised Worker Protection Standards for Agricultural Pesticides* (<https://www.epa.gov/sites/production/files/2016-10/documents/htcmmanual-oct16.pdf>).

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## **Immigration Concerns in Benzie County – Panel Discussion**

**Tuesday, May 23, 2017**

**6:30PM at Grow Benzie**

The Concerned Citizens of Benzie County are hosting a panel discussion with community members and leaders to explore the new immigration climate and its effects on the community, families, schools and the economy.

This panel will be a great way to have an open dialog about what the needs for growers are, and what rights migrant workers have when it comes to Immigration laws.

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## **Leelanau County HOUSEHOLD HAZARDOUS WASTE & ELECTRONICS COLLECTIONS**

**NOW ACCEPTING A MAXIMUM OF 10 - ONE GALLON CONTAINERS OF LATEX PAINT**

The collections are for Leelanau County Households and covered as part of the \$29 recycling fee on winter taxes. The collections are held from 8 AM – 2 PM and registration is required. Please call the Planning Dept. at 231-256-9812 to register.

### **2017 Saturday Collections**

**7/15 - Glen Lake School**

**8/19 - Peshawbestown**

**10/7- Elmwood Twp., Cherry Bend Park off Avondale Lane**

We are always looking for volunteers to help with the collections, please let us know if you are interested.

Thanks,

Leelanau Planning Department

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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>