Northern Michigan FruitNet 2017
Northwest Michigan Horticultural Research Center

Weekly Update

FruitNet Report – June 13, 2017

CALENDAR OF EVENTS

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

What's New?

- **Northwest Michigan fruit update – June 13, 2017**
- **Cherry leaf spot management at second and third cover timings**

NEW ARTICLES

Northwest Michigan fruit update – June 13, 2017

Fruit are sizing and recent stormy weather has been a concern for disease management

Emily Pochubay and Nikki Rothwell, MSU Extension

GROWING DEGREE DAY ACCUMULATIONS AS OF June 12, 2017 AT THE NWMHRC

Year	2017	2016	2015	2014	2013	2012	27 Yr. Avg.
GDD42	901	905	826	794	826	1222	881.8
GDD50	478	495	478	441	478	702	477.3

2017 Growth Stages as of 6/12/17

Bartlett Pear – 16 mm fruit
Potomac Pear – 19 mm fruit
Mac – 20 mm fruit
Gala – 15 mm fruit
Red Delicious – 16 mm fruit
HoneyCrisp – 18 mm fruit
Montmorency – 12 mm fruit
Balaton – 13 mm fruit
Hedelfingen – 13 mm fruit
Gold – 13 mm fruit
Napoleon – 14 mm fruit
Riesling – 10” – 16” fruit

Weather Report
Summer weather has hit northern Michigan. Daytime temperatures rose into the high 70s and low 80s degrees F over the last week. These warm temperatures will likely increase the rate of fruit development, and insect activity will also respond to these conditions. If the warm weather continues with moisture, disease development will also move along more quickly than when it was cool. Warm weather is predicted to continue throughout the week.

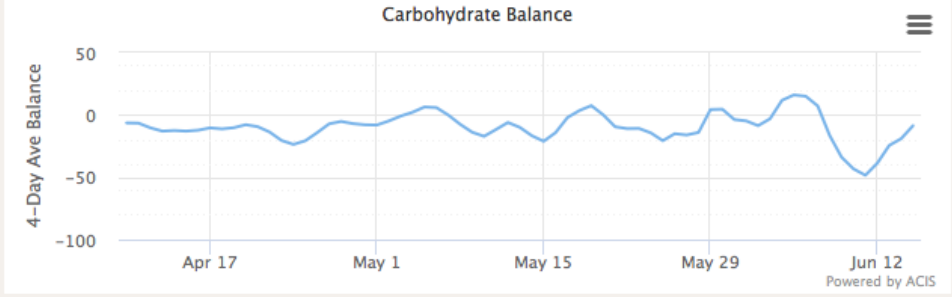
We have accumulated 901GDD base 42 and 478GDD base 50. Again, these numbers remain similar to our long-term averages. We had high winds on Saturday, and on Sunday, intense early morning thunderstorms were accompanied by more windy conditions. At the NWMHRC, the Enviroweather station recorded just less than one inch of rain on Monday, 12 June. The radar showed parts of Leelanau with a red cell over the county, and more rainfall was recorded in different parts of the NW MI region. We had some reports of hail during this last storm, but no damage from the hail has been

reported. Storms passed through the region again on Monday night 12 June and .17" of rain was accumulated.

Crop Report

Fruits are sizing across the board, and again, the warm weather will speed up development. Sweet cherries at the NWMHRC are around 13mm, which is large enough to start our spotted wing drosophila (SWD) testing. We are trying to determine the precise time when the fruit becomes susceptible to SWD oviposition—we hope this information will be helpful in determining when to begin SWD management in our different crops. Apples are also sizing, and most varieties at the NWMHRC are past the thinning window at this time. For growers that are still in the thinning window, the carbohydrate model shows that we are in a time of mild stress, and Monday's forecast suggests decreasing the thinning rate by 15% but by Tuesday, standard thinning rates should be used (Figure 1).

6/10	86	56	25.1	98.58	107.78	-9.20	-43.28	thinner rate by 30%
6/11	83	74	16.1	55.37	126.07	-70.69	-48.43	Decrease chemical thinner rate by 30%
6/12	81	63	9.8	40.62	103.46	-62.84	-38.75	Decrease chemical thinner rate by 15%
6/13	77	60	13.1	63.01	93.39	-30.38	-24.48	Decrease chemical thinner rate by 15%
6/14	82	61	16.0	72.40	102.20	-29.80	-19.07	Apply standard chemical thinner rate
6/15	82	64	17.2	74.83	106.81	-31.98	-8.62	Apply standard chemical thinner rate
6/16	82	61	22.6	97.00	102.77	-5.76		
6/17	77	59	17.1	84.27	93.00	-8.73		
6/18	73	57	19.5	97.37	85.37	12.00		



NEWA

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Figure 1. Apple carbohydrate thinning model output for Monday, 13 June at the NWMHRC.

Many growers have had some concerns about Ulster trees that are not bearing even though they are of bearing age. We have tried to find commonality among farms with this issue, but similarities have been limited and the cause remains a mystery. Originally, we hypothesized that the trees came from the same nursery, but upon further examination, we discovered that the trees were purchased from six different nurseries. The trees are also on a variety of different rootstocks: Mahaleb, Gisela 5, M x M60, M x

M2, Mazzard, and Gisela 6. Most of the incidents of the non-bearing Ulsters are located in northern Michigan, but there are Ulster trees on the Ridge that are not bearing and have a similar situation to our trees up north. The only common factor is the age of the trees, which are all 6-10 years old.

To further investigate possible causes of these Ulster orchards that are not bearing fruit, we sent in six samples to Washington State University to test for viruses. They used enzyme-linked immunosorbent assay (ELISA) to test for cherry leaf role virus, prunus necrotic ringspot virus, and prune dwarf virus. All of the samples came back negative for all three viruses. At this time, we still have no further evidence of what is causing this problem. We will continue to work toward identifying cause(s). We also would appreciate to hear from growers that have Ulster trees that are just coming into bearing to observe whether younger aged trees also have this non-bearing issue. Please call the NWMRHC if your farm has Ulster trees that are just coming into bearing this season.

Pest report

Recent windy weather and storms were ideal conditions for possible trauma blight infections. Many growers made streptomycin applications, and many were tank mixed with oxytetracycline products (particularly in orchards with streptomycin resistance) to prevent possible fire blight infections following these conditions. The streptomycin component of this tank mix will kill fire blight bacteria and provide limited systemic control of fire blight if tissues were infected. The oxytetracycline component of this mix will inhibit the growth of bacterial populations thereby lessening the risk of severe infections during these recent hot temperatures. As mentioned in previous reports, we are working with Dr. George Sundin's lab to monitor for streptomycin resistance, and we ask growers/consultants to contact the NWMHRC if fire blight infected shoots and ooze are present—we will collect samples and test the isolates for resistance.

With the exception of early morning and night rains on 12 June across the region, the last week has been mostly dry with just one infection period reported for the NWMHRC. However, rain has been variable across the northwest with some areas receiving a minimal amount of precipitation late last week. For example, in Bear Lake and Eastport had wetting events that resulted in low apple scab and cherry leaf spot infections on 8-9 June according to Enviroweather. All weather stations in the region are currently reporting cherry leaf spot infections following last night's rains on 12 June.

Although recent conditions have been dry, cherry leaf spot has gotten a foothold in some orchards and disease symptoms have progressed. We have received reports of orchards with sheet-like leaf spot lesions that cover nearly the entire leaf. As mentioned in last week's report, these orchards could have become infected during the long wetting period 22-25 May. Additionally, early season weather was generally cool and relatively dry with a few occasions that may have triggered leaf spot infections depending on localized weather even though Enviroweather stations did not record 'official' infection periods. The relatively cool and dry conditions may have caused growers to relax their leaf spot management programs, especially early when only bract leaves were showing; this scenario may have resulted in the current higher than anticipated leaf spot infections

in orchards at this time. Many orchards are past first cover timing when SDHI fungicides are suggested for leaf spot and powdery mildew, but if an SDHI was used in an orchard with existing leaf spot, a fungicide in this class should be very efficacious against leaf spot. Most growers are considering fungicide options for second and third cover timings and we encourage them to read the article, *Cherry leaf spot management at second and third cover timings,* for additional information.

Apple scab spore rods were collected and observed on 12 June. There were a total of two suspected scab spores on the rods, but positive identification was difficult as the rods were covered with pollen, microorganisms, and dirt following the thunderstorm. The most recent spore count on the Fruit Ridge was zero, and our colleague Amy Irish-Brown has reported that one more rain event will confirm whether or not primary is over on the Ridge. Similarly, primary apple scab is also ongoing in the Hart area. For the NW region, the apple scab model is reporting ~100% spore maturity with discharge percentages in the upper 90s. We are continuing to receive reports of low scab infections in orchards, and orchards with existing infections will need to keep fruit covered to prevent secondary scab infection on fruit. Finally, if orchards in the Bear Lake and Eastport areas became infected during brief wet weather late last week, scab lesions should appear later this week. Overall, many orchards appear to be free of scab at this time.

Codling moth activity is ongoing at the NWMHRC with a slight increase in trap numbers (Table 1). Based on the NWMRHC biofix of 31 May, we have accumulated ~200 GDD base 50 and egg hatch will likely begin later this week if temperatures continue to be as warm as predicted. At this time, one of the station's codling moth traps in our high-density apples has accumulated more than 5 moths per one trap meaning that treatment is warranted in that block.

San Jose scale male flight declined this week with only one male on a sticky card (Table 1). These trap numbers suggest that last week was the peak of first generation male flight. We will continue to visually monitor for crawlers on infested trees at the station.

Spotted wing drosophila have been detected in non-crop hosts as well as in a tart cherry orchard in northern Leelanau county. Please see the SWD table published in this week's FruitNet newsletter for more information. Green cherries are not susceptible to SWD, so no management tactics are recommended for SWD control at this time. Plum curculio egg laying is ongoing, and growers are continuing management programs for this pest. Fruit are still green in many areas, but we encourage growers to consider their SWD-PC management strategy when fruit begin ripening and turning straw-colored. Previous data have shown that SWD can infest straw-colored fruit, and these observations were confirmed with international colleagues that are also battling SWD in cherries. Cherry fruit fly have not been detected at this time.

American plum borer numbers continue to be low and lesser peachtree borer activity increased since last week (Table 1). We detected the first greater peachtree borers at the station this week (Table 1). The first obliquebanded leafroller adult was also detected this

week and whether or not this pest is detected again next week in our trapline will determine the biofix date.

Table 1. NWMHRC Insect Trapline Data, 2017.

Cherry - NWMRHC	**25-Apr**	**2-May**	**9-May**	**16-May**	**23-May**	**30-May**	**6-Jun**	**13-Jun**
GFW	14	1	6	2	14	0	0	0
ABP				2	5	14	1	4
LPTB						2	9	13
GPTB								2
OBLR								0
CFF								0
Apple - NWMHRC	**25-Apr**	**2-May**	**9-May**	**16-May**	**23-May**	**30-May**	**6-Jun**	**13-Jun**
OFM	0	0	0	0	0	0	0	0
STLM				52	18	33	9	3
CM					0	1	2	4
SJS					1	0	19	1
OBLR								1

Cherry leaf spot management at second and third cover timings

Emily Pochubay and Nikki Rothwell, MSU Extension

Recent reports of cherry leaf spot infections in northwest Michigan orchards range from substantial to low infections at this time. Many orchards are past the first cover timing, and growers are planning their leaf spot management strategy moving forward. The strategy recommended by MSU Extension has been to use an SDHI fungicide at the first cover timing to target cherry leaf spot and powdery mildew. The first cover spray is critically important, particularly for powdery mildew management, as previous research has shown that if this timing is missed, the amount of PM-infected leaves can increase by at least threefold at harvest. Although the SDHIs are among the best materials for CLS control, MSU Extension recommends that growers wait to use a second SDHI spray until the pre-harvest timing to prevent brown rot and to provide the longest residual control of cherry leaf spot after harvest. However, preventing the spread of conidia in already infected orchards will be critical for keeping this disease under control through harvest.

Fortunately, there are other materials to consider for leaf spot management at the second and third cover timings. These materials include Syllit, Gem, Captan alone, and copper products. Syllit is rated excellent for leaf spot, and Gem is rated good/excellent.

Both materials are at risk materials for cherry leaf spot resistance development, and as a result we remind growers that these materials should be tank mixed with Captan. Copper products are also excellent options for leaf spot, but we caution growers that coppers can be problematic with hot weather, which is predicted for the remainder of the week. The forecast is calling for cooler temperatures after this week's heat wave; hence, copper could be a good leaf spot option at that time/around the third cover timing. Additionally, we remind growers that Syllit and copper will not provide powdery mildew control, but Gem is an excellent mildew material. Please read the below sections for additional information regarding these materials.

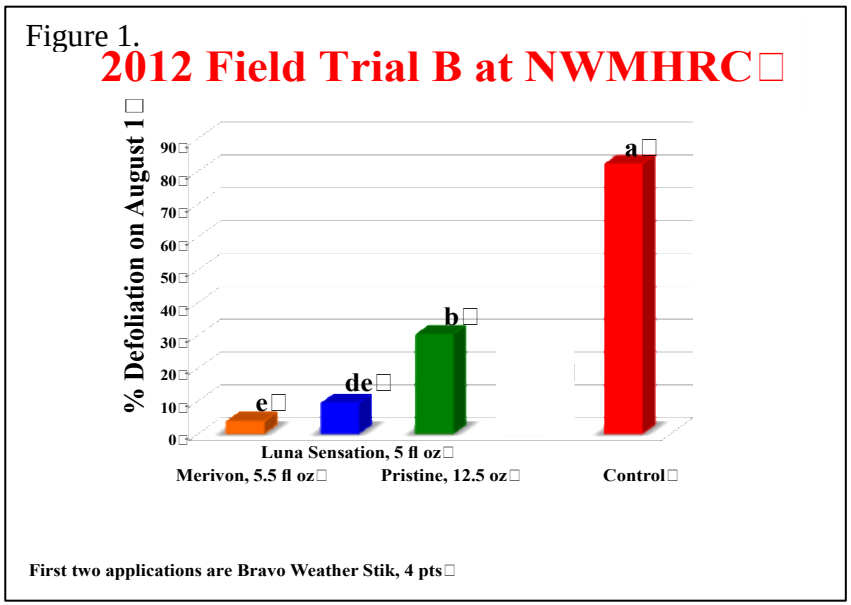
SDHIs (Group 7, 11) – Excellent first cover options for CLS and PM

The SDHI fungicide class, such as Luna Sensation or Merivon plus Captan, are excellent for CLS and PM control at the first cover timing. The SDHIs are the best fungicides currently available for CLS, and we recommend their use at the first cover timing to coincide with high CLS spore discharge as well as for PM protection. Growers have been concerned that the SDHIs are expensive, but a well-timed first cover application of these newer materials will provide ideal control of CLS and PM (Figure 1). There is high risk for the development of resistance to SDHI fungicides and a protectant such as Captan should be tank mixed with these materials. Using the highest label rate will aid in effectively killing the pathogen and also prevent the development of CLS resistance to SDHIs. These materials are also recommended at the pre-harvest timing. **Note:** According to the Luna Sensation and Merivon labels, it is not permitted to apply more than two sequential applications of a Group 7 or 11 fungicide before rotating with a fungicide from a non-Group 7 or 11.

Syllit (Group U12) + Captan (Group M) and Copper – Rated 'excellent' for CLS; no PM activity

Although Syllit is typically suggested as a second or third cover CLS material, copper is also an option for CLS when conditions are cooler. If Syllit or copper is used during first cover, an efficacious fungicide for PM should be included in the disease management program, as these fungicides will not provide PM control. Syllit is an at-risk fungicide, and this material should be mixed with Captan for resistance management. Finally, growers should use caution if applying Syllit in hot temperatures as we have observed phytotoxic effects from Syllit when this material is applied in hot weather.

Figure 1.



Gem (Group 11) – Rated 'good/excellent' for cherry leaf spot and 'excellent' for powdery mildew

Although not as effective as the SDHIs, Gem is rated 'good' to 'excellent' for CLS and because is it also rated 'excellent' for PM, it is a decent option for preventing these diseases at the first cover timing. The label rate for Gem is 1.9 – 3.8 fl oz per acre, however, a higher rate (3.0-3.8 fl oz per acre) and including a protectant fungicide is recommended for effective CLS control and resistance management. Gem is a strobilurin fungicide, which is a site-specific or single-site fungicide meaning that only one mutation of the pathogen's target site is needed for development of resistant strains of the CLS fungus. Because Gem has a higher likelihood to developing resistance in the leaf spot pathogen, we recommend tank mixing with Captan. If CLS resistance to Gem were to occur, the Captan component of a Gem + Captan mix should provide CLS control. Furthermore, data from the 2015 efficacy trial showed that a season-long Captan program effectively managed CLS. However, Captan alone will not provide activity against PM. **Note:** Gem is a Group 11 fungicide so use caution if using both Gem and SDHI products in an orchard's spray program.

Table 1. Cherry leaf spot and powdery mildew fungicide efficacy results, 2015

Treatment	Timing	% Infection	% Defoliation 20 July 2015	% Defoliation 9 Sept 2015	% Mildew Infection 20 July 2015
1. Bravo Weather Stik 4 pt Luna Sensation 5 fl. oz. + R56 0.125%	AB CDEF	62.1 bc	7.3 b	82.2 bc	0.8 c
2. Bravo Weather Stik 4 pt Luna Sensation 5 fl. oz. + R56 0.125% + Captan 80 WDG 2.5 lb	AB CDEF	42.5 d	5.2 b	66.8 cd	1.0 c
3. Bravo Weather Stik 4 pt Merivon 5.5 fl oz + Sylgard (0.03%)	AB CDEF	53.6 bcd	11.3 b	63.4 d	0.0 c
4. Bravo Weather Stik 4 pt Captan 80 WDG 2.5 lb	AB CDEF	45.2 cd	3.5 b	53.0 d	9.7 ab

Untreated Control		95.5 a	31.2 a	99.7 a	23.9 a

Captan – Rated 'good/excellent'
Recent data suggest that Captan alone at a rate of 2.5 lb/A provides good to excellent control of cherry leaf spot disease (Table 1). MSU Extension initially investigated Captan alone for leaf spot control to provide growers with an early season leaf spot material that could be used between sprays of chlorothalonil if needed. Captan is a protectant fungicide that must be applied prior to rain to be efficacious. Captan does not provide back action and will not 'burn out' infections that have already occurred; hence, this material is best used in orchards that have no or very little existing leaf spot infection.

Copper – Rated 'excellent' for cherry leaf spot
Copper does not provide control of powdery mildew and is best for targeting CLS at second or third cover. Growers who are planning to spray copper for CLS should use caution as this material can be phytotoxic in hot conditions.

ARTICLES FEATURED IN PAST FRUITNET REPORTS

NEW Agriculture Container Recycling Program!

American Waste is no longer recycling ag containers for free at their facility. But no worries! Growers will be able to recycle their containers free of charge at various locations in Northwest MI.

Where are the collection sites?

- Wilbur-Ellis Co
  8075 US-31 Williamsburg, MI 49690
- Ellsworth Farmer's Exchange (Co-op)
  6509 Center St. Ellsworth, MI 49729
- CHS Inc
  6766 E Traverse Hwy Traverse City, MI 49684
- Crop Production Services (CPS)
  13343 Pleasanton Hwy, Bear Lake, MI 49614

When can I drop off my ag containers?

- June 26-29: You can drop off your materials during regular business hours at any collection site listed above during the last week of June. G. Phillips & Sons (the ACRC contractor) will pick up containers on Friday, June 30.
- Post-harvest collection: TBD (end of September/first week of October)

What do I do to prepare the containers for recycling?

- Triple rinse, remove caps, remove loose leaf labels (if possible), put in large/clear plastic bags OR string together 20-30 containers with twine – if the containers are not up to these standards, they will not be accepted.
- All non-refillable, high-density polyethylene (HDPE) plastic crop protection and specialty pesticide product containers in sizes up to and including 55 gallons are accepted.

Questions? Contact Lauren Silver (lsilver@gtcd.org) or Lizzy Freed (lfreed@gtcd.org) at the Grand Traverse Conservation District. Ph: 231-941-0960

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, he 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

Treatments

	Treatment/ Formulation	Rate Product/Acre	Application Code
1	Untreated		
2	LORSBAN 75 WG	1 lb/a	A
	Damoil	1 % v/v	A
3	Closer SC	3 fl oz/a	B
	R-11	0.125 % v/v	B
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

Legend

App. Code	Application Target	Spray Date
A	Delayed Dormant	30-April
B	Tight Cluster	6-May
C	Pink	7-May
D	Bloom	13-May
E	Petal Fall	23-May

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[a]	% Fruit Infested 3 Oct [b]
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 Damoil	14 fl oz/a 1 % v/v	B B	0.9 bc	9.0 ab
5	Sivanto 200 SL R-11	10.5 fl oz/a 0.125 % v/v	D D	1.8 a	19.0 a
6	Sivanto 200 SL Damoil Movento 240 SC R-11	10.5 fl oz/a 1 % v/v 6 fl oz/a 0.25 % v/v	B B E E	0.2 cd	3.5 bcd
7	Movento 240 SC R-11	9 fl oz/a 0.25 % v/v	E E	0.1 cd	1.5 cd
8	Centaur WDG Damoil	46 oz/a 1 % v/v	A A	0.0 d	0.0 d
9	Centaur 40 SC Damoil	71.5 fl oz/a 1 % v/v	A A	0.0 d	1.0 cd
10	Centaur WDG Damoil	46 oz/a 1 % v/v	C C	0.0 d	0.5 cd
11	Centaur 40 SC Damoil	71.5 fl oz/a 1 % v/v	C C	0.0 d	0.0 d

Means followed by same letter do not significantly differ (*P*=0.05, Duncan's New MRT)
[a] ANOVA performed on square-root transformed data; data presented are actual counts
[b] 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

Treatments

Treatment/ Formulation	Rate Product/ acre	Appl. Timing
1 Untreated Check		
2 Sivanto Prime SL	14 fl oz/a	A
Damoil 90 EC	1 % v/v	A
3 Sivanto Prime SL	14 fl oz/a	B
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

Legend

Appl. Code	Appl. Target	Appl. Date
A	Half inch green	19-Apr
B	pink	26-Apr
C	petal fall	19-May
D	1C(CM bio+250DD)	8-Jun

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 potential**
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.

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. 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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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 PLCHP 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/htcmanual-oct16.pdf).

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