Northern Michigan FruitNet 2017
Northwest Michigan Horticultural Research Center

Weekly Update

FruitNet Report – September 8, 2017

CALENDAR OF EVENTS

01/16 – 17/2018 **Northwest Michigan Orchard and Vineyard Show**

What's New?

- **NEW Agriculture Container Recycling Program!**
- **Investigating peach susceptibility to SWD in Northern Michigan**
- **FruitNet for Grape Growers**
- **Look-a-like late season apple damage by bitter pit, brown marmorated stink bugs or apple maggot**
- **Cornell grape research update provides information on managing sour rots**

NEW ARTICLES

Investigating peach susceptibility to SWD in Northern Michigan

In the FruitNet report sent out on 25 August, 2017, we had observed spotted wing

drosophila (SWD) and related fruit flies flying around and potentially laying eggs into peaches. In recent SWD host preference testing, MSU and other research institutes have found that SWD primarily lay into peach fruit that have been damaged: split pits, bird pecks, brown rot, etc. Healthy peach fruit is not typically a preferred host for SWD. Mike Haas, MSU technician located at the Trevor Nichols Research Center, conducted choice and no-choice tests with SWD in peaches, and he found very few SWD larvae in intact peaches (personal communication). Additionally, Dr. Bill Shane, MSU peach breeder, has observed SWD laying eggs into peaches only when fruit firmness is less than 3 pounds of pressure.

A recent research refereed article published by Brazilian researchers also concluded that damaged peaches are more susceptible to SWD infestation than undamaged peaches (Andreassi et al 2016). They compared suitability of the following hosts: 1) undamaged peaches, 2) mechanically damaged peaches, 3) peaches that were infected with brown rot, and 4) undamaged strawberries, which are highly susceptible to SWD in Brazil. Researchers found that when peaches were damaged, they became as susceptible as undamaged strawberries. They also found that peaches infected with brown rot *were not* more susceptible to SWD compared to undamaged peaches.

As previously mentioned, we observed SWD eggs in commercially grown peaches in a northwest Michigan orchard; these oblong eggs had two breathing tubes, which are distinctive of SWD eggs. Based on prior research and our recent field observations, we conducted two preliminary experiments to determine if SWD attack intact peaches and characteristics of peaches that may increase their risk of infestation.

For the first experiment, we sampled peaches from the commercial orchard where SWD eggs were observed in peaches to determine if SWD larvae would survive. We collected seven peaches var. Rising Star that were observed for the presence/absence of suspected SWD eggs in the lab. Using a dissecting microscope, we found that five of the seven peaches had visible eggs laid under the peach skin. Peaches were individually placed into deli cup containers and left for four days. Using the standard brown sugar sampling method, we counted the number of larvae from the peaches. We extracted larvae from six of the seven peach samples; this result indicates that eggs may not always be easily detected as we only observed five fruit with eggs. Total larval counts in relation to peach firmness measurements are in Table 1. To determine if the larvae in the peaches were SWD, we reared out a sub-sample of the larvae on prepared diet used in SWD experiments. A total of 107 larvae were placed in diet and 24 adult drosophila flies have emerged at this time. Of the 24 emerged flies, two of them were SWD. From this preliminary experiment, data suggest that other Drosophila larvae were more commonly found in the intact peaches, particularly if they are under three pounds of pressure (Table 1).

Table 1. Peach firmness and infestation			
Sample	**Eggs Present (Yes/No)**	**Average Pressure (lb)**	**# of *Drosophila* larvae**
1	Yes	8.25	1
2	No	5	1
3	No	19.25	0
4	Yes	2	102
5	Yes	11.75	7
6	Yes	6.25	13
7	Yes	2.25	144

The second experiment consisted of choice and no choice tests with five different peach varieties: Red Haven, Glowing Star, Rising Star, PF 28, and Coral Star. Peaches were field collected; peaches had been previously sprayed with standard insecticide programs. For the choice test, we placed one visually intact peach of each variety into an insect tent, which was replicated four times. We released three male and three female SWD into the tent; peaches were removed from the tents after two days. We also set up no-choice tests, where each peach variety was placed into a separate deli container, and three male and female flies were placed into those containers. No-choice tests were replicated four times. After eight days, we counted the number of SWD larvae in all fruits. Peach varieties were also measured for brix and firmness. These varieties ripen at different times during the season, and we wanted to determine if sugar content and/or fruit firmness would influence SWD oviposition.

Results showed that very few SWD larvae were recovered from the choice tests. Previous insecticide programs may have influenced overall numbers. However, we did find SWD eggs, larvae, and adults in two Rising Star treatments: 1) four larvae and two adults and 2) two pupae and 401 eggs. Overall, no-choice tests had slightly higher SWD totals than choice tests. However, Rising Star was the most susceptible variety: 11 larvae, 15 pupae, and seven adults. Only one SWD pupa was found in each of the Coral Star and Glowing Star treatments. One pupa was observed in PF28, but it was found in a peach with a cracked pit. Overall SWD recovered from intact peaches was extremely low, but Rising Star had the highest level of SWD infestation (33 total SWD). No SWD were detected in var. Red Haven.

As expected, early peach varieties were softer than later varieties (Figure 1). Rising Star had the softest fruit (13.28 lb) and the highest numbers of SWD. Additionally, Rising Star also had numerically the lowest brix levels. These preliminary data suggest that firmness factors into peach host susceptibility more than brix levels.

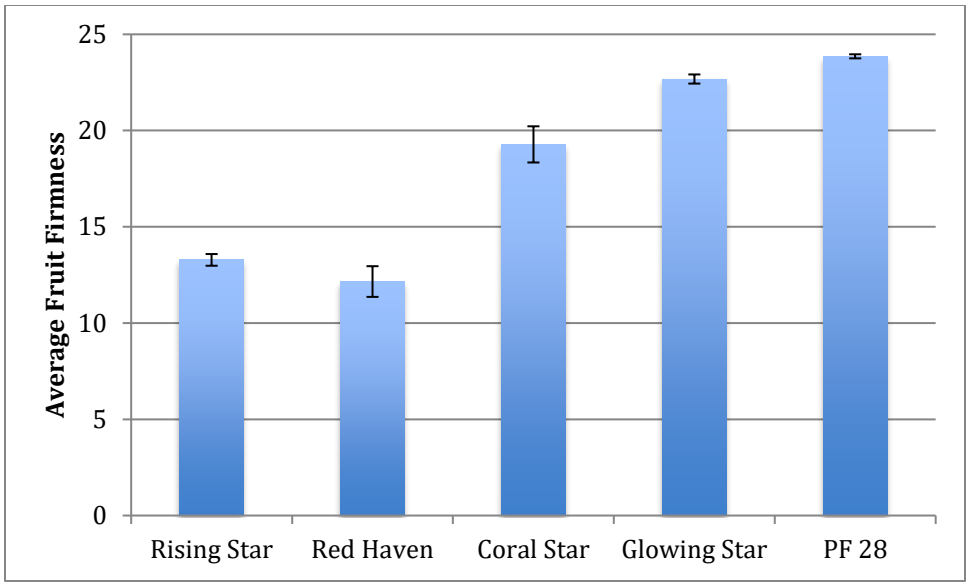

Figure 1. Average fruit firmness of five peach varieties collected from NW MI on 28 Sept.

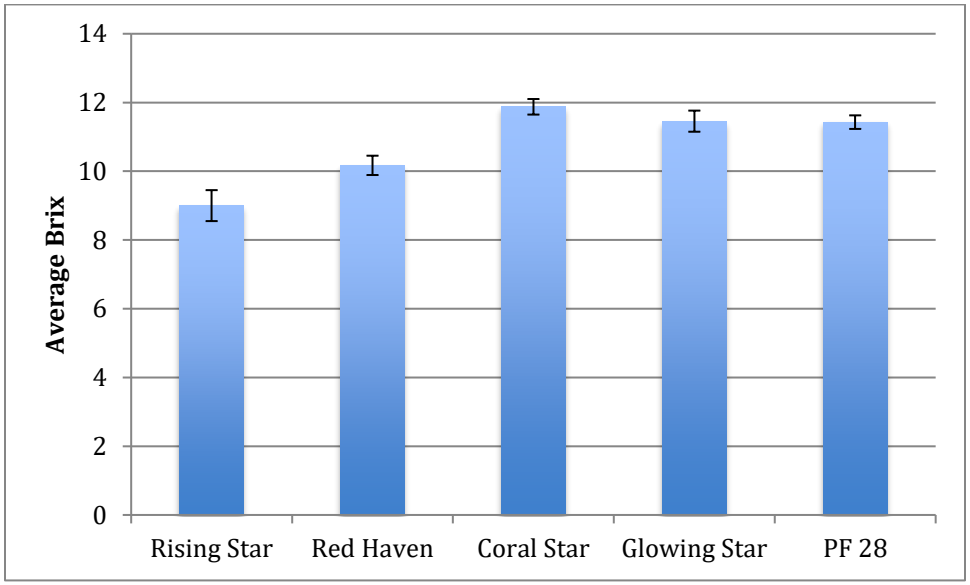

Figure 2. Average brix levels of five peach varieties collected from NW MI on 28 Sept.

To conclude, the data of this small-scale trial suggest that intact peaches are not a preferred host of SWD, but infested intact fruit is a possibility. Additionally, we learned that SWD can lay eggs into firmer fruit at ~13 lb of pressure or less than has been observed in previous research. These results are similar to other work conducted in peaches in that softer peaches are suitable hosts for SWD. Further experimentation is warranted to gain a better understanding of how SWD egg-laying impacts peach quality and peach characteristics that are more conducive for SWD to complete its lifecycle on peaches.

FruitNet for Grape Growers

With the introduction of the new viticulture educator, we have decided to put together a FruitNet solely for grape growers and we need your email addresses! Please contact Jenn at goodr100@msu.edu or 231-946-1510 to be added to the grape specific FruitNet Report.

NEW Agriculture Container Recycling Program!

American Waste is no longer recycling ag containers for free at their facility. However, 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)
  11900 Byers Rd. 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?

- September 27- October 3: You can drop off your materials during regular business hours at any collection site listed above during these dates. G. Phillips & Sons (the ACRC contractor) will pick up containers on Wednesday, October 4.

One Additional Site: Drop off ONLY on October 4th

- Cherry Bay Orchards
  2801 N. Jacobson Rd. Suttons Bay, MI 49682
  This will be a ONE-DAY collection. You may drop off your containers between **8:00 am and 3:00 pm on October 4th**.

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

Look-a-like late season apple damage by bitter pit, brown marmorated stink bugs or apple maggot

It can be tricky to tell the difference between insect damage and bitter pit in apples close to harvest. View photos and descriptions of late season damage and their causes in apples.

Posted by **Julianna Wilson**, Wilson and Larry Gut, Michigan State University, Department of Entomology, and Amy Irish-Brown, Michigan State University Extension, MSUE News

Apple maggot stings (above, Harvey Reissig, Cornell Univ.) and stink bug feeding (below, Phil Schwallier, MSU Extension) can be mistaken for bitter pit.

Apples are susceptible to a number of different defects that appear close to harvest. Previously, bitter pit had no rivals that could be mistaken for it. Now, there are two insect pests—an old one and a new one—that can cause injury easily mistaken for bitter pit and vice versa.

Bitter pit

Bitter pit is a disorder associated with nutrient imbalance in developing apples. Some cultivars – Honeycrisp in particular – are more prone to bitter pit than others. The symptoms are shallow depressions, mainly confined to the calyx or flower end of the apple, with internal corking below the surface that does not meet the skin (see photos below). Within a given orchard of a susceptible cultivar, bitter pit can show up anywhere in the orchard, not just at the edges. This is an important contrast with where you are most likely to find damaged apples from apple maggot stings or stink bug feeding in an orchard.

Apple maggot: an old pest causing unexpected injury

Prior to the broader use of systemic insecticides in apple orchards against internal fruit pests, when the apple maggot slipped through the cracks of a spray program and started laying eggs, fruit would be obviously wormy. Now when a treated apple is stung by a female apple maggot laying an egg, the egg will fail to develop and instead will leave behind an injury that looks much like bitter pit or feeding damage by stink bugs.

Unlike bitter pit damage, injury from apple maggot stings can occur anywhere on the apple. If you have an orchard block with a history of apple maggot and you or your field scouts are not using monitoring tools to know whether apple maggot populations are increasing, you may find injury of this type in your orchard in the late season (see photo below). Concentrate your search for damage along orchard edges near wooded borders where apple maggot is most likely to occur.

Apple maggot stings (egg-laying injury) without tunneling larvae. Photo by Harvey Reissig, Cornell University.

Brown marmorated stink bugs: a new pest

Both nymphs and adults of the newly invasive brown marmorated stink bug (BMSB) can

injure apples when they feed on fruit. These stink bugs may do some exploratory feeding earlier in the season in apples that can deform fruit as it continues to grow, but most of the damage from brown marmorated stink bugs is expected to occur within a few weeks of harvest, particularly at the timing of soybean dry down. There are also native stink bugs that will feed on apples and the damage will look just like feeding damage by brown marmorated stink bugs.

Unlike bitter pit damage, brown marmorated stink bug feeding damage can occur anywhere on the apple or may be most common around the shoulder. Also, the internal corking caused by the stink bug's injury will meet the skin, whereas bitter pit corking will not.

Most of the damage from brown marmorated stink bug will occur in trees along orchard edges that are bordered by woods, peach orchards, or soybean fields (for a list of other crops favored by the pest, see the BMSB report from August 1, 2017). Field scouts should be using limb-jarring over beating trays to monitor for brown marmorated stink bugs in orchard edges. Traps baited with lures set up between woods or other crops and the target apple orchard can also help determine whether this pest is moving into orchards and potentially causing damage.

What damage from exploratory feeding by stink bugs looks like mid-season in apple. Photo by Amy Irish-Brown, MSU Extension.

What external damage by stink bug feeding looks like at harvest; feeding damage by stink bugs can occur anywhere on an apple, and often appears on the shoulder. Photo by Jim Engelsma.

Internal damage probably caused by stink bug feeding in Empire apples. Photo by Phil Schwallier, MSU Extension.

Select fruit at random within a given area to estimate fruit damage
It's easy for the eye to pick out damaged fruit and to over-estimate how much of the fruit is damaged across an orchard or in a harvest bin. To get a true estimate of fruit damage in a given orchard or orchard margin, it is important to randomly select fruit for inspection, as opposed to seeking out and counting only fruit with damage. Select 50 or 100 fruit and count how many are damaged to estimate overall fruit damage in a given area. Taking into consideration the cultivar and its susceptibility to bitter pit while monitoring for apple maggot and brown marmorated stink bug will help with making the right management decisions in the future.

For more information about management strategies for apple maggot or brown marmorated stink bugs in apples, please refer to the Michigan State University Extension Bulletin E0154, "2017 Michigan Fruit Management Guide", or to the BMSB-specific fact sheet, "Managing Brown Marmorated Stink Bug in Michigan Orchards".

For more information on bitter pit, see the MSU Extension article "Bitterpit control in apples".

For more information on apple nutrition, see the bulletin "Apple Nutrition".

Cornell grape research update provides information on managing sour rots

Read researchers' latest findings for managing sour rots and interactions with microbes and vinegar flies.

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

Sour rots can be an issue for grape growers at harvest time, but they can also be challenging to manage. A team at Cornell University has just released a "Research Focus" report that highlights results from the last four years of studies led by graduate student Megan Hall working with Wayne Wilcox and Greg Loeb on the disease and insect components of this complex. Full details can be seen in Defining and Developing Strategies for Managing Sour Rot.

The article provides some key management concepts from their research including:

1. Inoculation with microbes found in rotten berries was not sufficient to produce sour rot symptoms.
2. Sour rot symptoms developed only when Drosophila fruit flies were added to experimental inoculations.

3. Field spray trials over three years with antimicrobials targeting the yeast and bacteria alone provided modest reductions in sour rot severity.
4. Including insecticides targeting Drosophila fruit flies dramatically reduced sour rot severity.
5. High cordon-trained Vignoles had higher severity of sour rot than midwire cordon-trained vines with vertical shoot positioning in 2014, 2015 and 2016.

They summarize the article by highlighting that management of sour rot involves controlling both the microbes and the Drosophila fruit flies. Here in Michigan we have variable risk of sour rot in different growing seasons, and we have both the native fruit flies and the invasive spotted wing Drosophila. Both types of flies can play a role in moving sour rot pathogens between berries and enhancing the level of infection. In our work in Michigan, we have seen higher sour rot levels in vineyards where there are also more vinegar flies, so we expect these results to be applicable to helping manage sour rot in Michigan vineyards too.

Articles featured in past FruitNet Reports

Sign-up to receive Apple Maturity Reports

If you would like to start receiving the Apple Maturity Reports from the NWMHRC, please contact Jenn at 231-946-1510 or goodr100@msu.edu to be added to the list.

Predicted 2017 Apple Harvest Dates

Phillip Schwallier, District Horticulture Educator Amy Irish-Brown, District ICM Educator MSU Extension

The predicted harvest dates for every MAWN weather station is now available on Enviroweather web site at Michigan State University. We have less confidence in this year's prediction for the middle of the state. Frost and a long cold bloom make it difficult to predict the exact full bloom dates. Apple set is from two year old and in some places from one-year-old wood that will produce a very mixed maturity at harvest. In general, 2017 Predicted Harvest Dates are roughly a few days ahead of normal except in the north, which might be normal. Predicted dates are a fairly normal except in the north ahead of last year. Bloom dates this spring were early in the south and normal in the north. May was a cold month and a long drawn out bloom period especially in the middle of the state. We do expect mixed maturity at harvest time due to the long bloom.

As always, the weather seems to be unusual each year and 2017 was no different. It

began with what appeared to be another very early spring, however, cold May weather delayed bloom to a more normal timing from the middle state to the north. Most areas bloomed early. The cold May was also very dry and June followed with normal to hot temperatures, which give us early to normal predicted harvest dates. Frost damage is considerable and the state's cropload is approximately 65% of normal. The tops of trees are heavy and the bottoms are light. Blocks with light croploads will mature 3 or 4 days sooner then the predicted harvest dates. Heavy croploads will mature 7 days later than the predicted dates.

The normal harvest dates for other varieties are listed in Table 3 for the Grand Rapids area. This year's 2017 predicted dates are a rough estimate based on the McIntosh, Jonathan and Red Delicious predicted dates. Other areas of the state should adjust non-predicted varieties based on their own history. ReTain application should be applied 30 DBH (days before harvest). Use Table 3, 2017 Predicted Harvest Dates for Other Varieties, to time ReTain applications and adjust for varieties and locations.

Table 1. 2017 predicted peak harvest dates.

Full bloom date 2017				**Predicted harvest date 2017**			
Station	**McIntosh**	**Jons**	**Reds**	**McIntosh**	**Jons**	**Reds**	**Observer**
SWMREC	23-Apr	24-Apr	25-Apr	28-Aug	15-Sep	22-Sep	Shane
Deerfield	25-Apr	26-Apr	27-Apr	29-Aug	18-Sep	25-Sep	Tritten
Romeo	28-Apr	1-May	1-May	2-Sep	25-Sep	1-Oct	Tritten
Peach Ridge	1-May	5-May	7-May	5-Sep	27-Sep	4-Oct	Irish-Brown
Hart	11-May	13-May	14-May	13-Sep	30-Sep	6-Oct	Irish-Brown
NWMHRS	19-May	20-May	21-May	19-Sep	8-Oct	14-Oct	Rothwell

Table 2. 2017 predicted peak harvest dates compared to normal and last year.

Days ahead of normal				Days ahead of last year		
Station	**McIntosh**	**Jons**	**Reds**	**McIntosh**	**Jons**	**Reds**
SWMREC	10	6	6	2	1	0
Deerfield	10	3	7	3	-1	0
Romeo	11	0	2	5	1	4
Peach Ridge	10	-1	1	2	2	1
Hart	5	3	8	0	2	2
NWMHRS	3	-2	3	1	-8	-7

Table 3. Normal and 2017 peak harvest dates for varieties for the Grand Rapids area

Variety	Normal date	2017 predicted date
Paulared	8/24	8/19
Gingergold	8/26	8/21
Gala	9/10	9/5
McIntosh	9/15	9/5
Honeycrisp	9/18	9/15
Empire	9/26	9/25
Jonathan	9/28	9/27

Jonagold	9/28	9/27
Golden Delicious	10/2	10/1
Red Delicious	10/5	10/4
Idared	10/10	10/9
Rome	10/15	10/14
Fuji	10/25	10/24
Braeburn	10/25	10/24
Goldrush	11/1	10/31

WEB SITES OF INTEREST:

Farmer to Farmer - Connecting Farmers, Cultivating Community
http://www.f2fmi.com

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://www.canr.msu.edu/nwmihort/nwmihort_northern_michigan_fruit_net

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