WISCONSIN UNIVERSITY OF WISCONSIN-MADISON
UW Extension University of Wisconsin-Extension

Wisconsin Fruit News

Volume 3, Issue 5 – June 15, 2018

In This Issue:

General Information

A new invasive fly – the African fig fly

By: Janet van Zoeren and Christelle Guédot, UW-Extension

Common Names: African fig fly
Order: Diptera
Family: Drosophilidae
Scientific Name: *Zaprionus indianus*

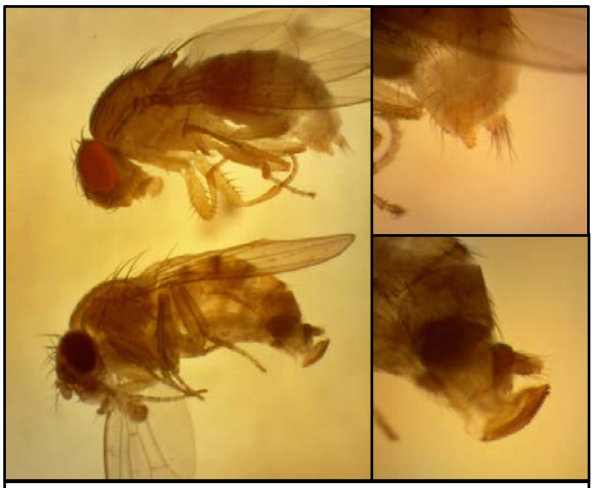
The African fig fly (AFF, *Zaprionus indianus*) is an invasive fruit fly, closely related to the genus Drosophila, which was first detected in Wisconsin in 2012 as one specimen. We have been keeping an eye out for AFF, in particular in our spotted wing drosophila traps and 2017 marked the first year with a small population of this species in the state. AFF is not able to damage or infest intact fruit in the way that spotted wing drosophila does, and, to date, has only been shown to cause economic injury in the fig industry. However, AFF can be a secondary pest of many fruit crops, with yet unknown economic impact. Additionally, they can expand their range and proliferate rapidly, making AFF an invasive species of concern to keep an eye on. Throughout the spring, summer and fall of 2017 we caught AFF in our spotted wing drosophila traps, and we will continue to monitor for this pest in 2018. It is likely that AFF travel on wind patterns to Midwest from Southern states where it is now established.

Host Range: AFF is able to feed on a large number of berry fruit crops we grow in Wisconsin, including grapes, strawberries, raspberries, blackberries, blueberries and peaches. There is some evidence that grape is a preferred host for AFF. However, it is only able to feed on fruit that is over-ripe or already damaged, so, although they may contribute to fruit breakdown or secondary infection, they cannot cause the initial damage to intact, ripe fruit.

Identification and Life Cycle: The AFF has a very distinctive appearance, and is easy to identify under magnification. The adult fly has a light-colored body and bright red eyes, and is slightly larger than the typical drosophilid flies, such as spotted wing drosophila. Under a hand lens, three obvious white stripes bordered in black are seen running along the length of each side on the fly's back and sides (head and thorax). The larvae, or maggots, are legless and have a single hook-like tooth at the mouth-end with which they feed within berries and other soft fruit. The larvae are nearly indistinguishable from drosohilid maggots, such as spotted wing drosophila.

African fig fly adult. Photo courtesy of Ben Jaffe.

The AFF is native to tropical climates, and it is unlikely they would be able to survive even a mild winter in Wisconsin. However, they are able to travel long distances on air currents, and are expected, at least some years, to move up from Florida in the summers, and to infect our fruit in the summer and fall. So far, AFF has only been found in Wisconsin in the summer of 2012 and 2017, and we will be monitoring to see if they return in 2018.



AFF (upper left) and its ovipositor (upper right) and SWD (lower left) and its ovipositor (lower right). Photos courtesy of Doug Pfeiffer, Virginia Tech.

They develop from egg to adult in 20 days (in the laboratory at 75F), and females lay on average 60 eggs, so once AFF reaches Wisconsin each year, populations will be able to build up quickly. We do not know at this time how many generations there would be per year in Wisconsin. Please see the berry article on page 4 of this issue for more information about trap catch data from 2017 in Wisconsin.

Damage Symptoms: Like spotted wing drosophila and other drosophilid flies, AFF lays eggs inside fruit, where the larvae develop. Unlike spotted wing drosophila, AFF has a weak ovipositor and is unable to cut into undamaged fruit. For this reason, AFF is expected to only be present in rotting or previously damaged fruits. However, AFF is a relative newcomer to more temperate climates, so specifically which crops will be affected and how strongly remains to be seen.

Because AFF and spotted wing drosophila exist in similar habitats, they are likely to interact with each other. AFF may lay eggs in fruit damaged by spotted wing drosophila females, and populations are expected to build up alongside spotted wing drosophila. It is unknown at this time, but competition between AFF and spotted wing drosophila may serve to help keep spotted wing drosophila populations in check.

Monitoring and control: ***All management practices previously described for spotted wing drosophila would help manage AFF populations.*** Scouting for the AFF can be done using the same traps as those used for spotted wing drosophila. These are both available commercially, or can be made by putting some small holes in the top of a deli cup. The traps should be baited with a yeast-sugar solution or a commercial spotted wing drosophila lure. It is not recommended to test the fruit directly to determine infestation rates for AFF, since the larvae of AFF will be indistinguishable from the other drosophila maggots that may be present in damaged fruit.

Cultural control: Cultural control practices, such as sanitation, may help to mitigate AFF population build up each year. When feasible, removing all damaged or rotting fruit from the plantings, and solarizing or freezing it to kill drosophilid larvae, will help prevent successful AFF development on your property. This is already a recommended practice to help reduce spotted wing drosophila numbers. Because AFF is able to move long distances, they will be able to re-infest yearly from southern climates, even on a farm with excellent sanitation practices.

Netting, or exclusion, which has been done with some success to prevent spotted wing drosophila infestations, will additionally prevent AFF infestations. When using netting, the mesh size must be no greater than 1/32 inch. It is best to net

the fruit after early fruit set, so as not to interfere with pollination, but before fruit begins to ripen. Additionally, it is important to ensure the mesh is adequately fastened to itself and to the ground, so adult AFF cannot sneak in through any holes.

Chemical control: Chemical control is not yet recommended in Wisconsin, as AFF populations are not currently at infestation levels. If spraying does become necessary, it will be beneficial to choose an insecticide that also shows efficacy against spotted wing drosophila. Some insecticide classes that are effective against both AFF and spotted wing include spinosyns, carbamates, and organophosphates. As always, it is recommended to rotate IRAC chemical classes to delay insecticide resistance, and to consider the effects on non-target and beneficial insects. Please check the 2018 Midwest Fruit Pest Management Guide for full product recommendations. If you suspect that you have found AFF, please contact the University of Wisconsin-Madison/Extension Insect Diagnostic Lab at (608) 262-6510, idl@entomology.wisc.edu or http://labs.russell.wisc.edu/insectlab/contact-us/.

UW-Madison/Extension Insect Diagnostic Lab update

By: PJ Liesch

Insect activity has increased significantly around the state as we move towards the official start of summer. As summary of fruit-insect cases handled at the UW Insect Diagnostic Lab over the last two weeks can be found below:

One of the commonest fruit insects being reported thus far in 2018 has been the **grape flea beetle**. While adult beetles can be a concern when they feed on developing grape buds, the larvae can cause conspicuous damage as they skeletonize grape leaves. Reports from around the state continue to come in—mostly from home gardeners.

Damage from the **plum curculio** has been noticed in the southern part of the state on apples. Growers that missed scouting and treating after petal-fall may notice the distinctive crescent-shaped scars on developing fruit.

Stink bug reports in gardens and fruit setting have increased recently. The commonest species being reported from around the state is ***Banasa dimidiata***. This species can feed on a wide range of landscape plants and small fruits. Juvenile **brown marmorated stink bugs** (2nd instar nymphs) were reported from a home garden in Dane county in early June. Growers in parts of the state with known BMSB activity should be on the lookout for the dark-colored, tick-like nymphs of BMSB as well as adults.

Minor plant bug activity has been noted recently. **Tarnished plant bugs** have been spotted in garden vegetables and small fruits in southern and central Wisconsin. In addition, a report of **apple red bug** recently came in from La Crosse county.

Gypsy moth caterpillars have been reported in several spots in the southern part of the state (Dane, Walworth, and Columbia Counties). Caterpillars of the gypsy moth are often found in wooded areas in association with oaks and other hardwood trees, but they can also feed on a range of fruit trees. **Eastern tent caterpillars** also remain active around the state and occasionally damage apples, cherries, and similar tree fruits. By now, tent caterpillar are large and would have conspicuous silken tents. Two other caterpillars of interest were recently noted on fruits in the state; neither of which is expected to be a significant concern for the plants: caterpillars of the **viceroy butterfly** (on apple in Douglas Co.) and the caterpillars of the **gray comma butterfly** (on currants in Sauk County).

Spotted wing drosophila has not yet been reported for the year at the UW Insect Diagnostic Lab, but growers should be monitoring for activity.

UW-Madison/Extension Plant Disease Diagnostic Clinic (PDDC) update

By: Brian Hudelson, Sue Lueloff, John Lake and Ann Joy

The PDDC receives samples of many plant and soil samples from around the state. The following diseases/disorders have been identified at the PDDC from June 2, 2018 through June 15, 2018.

PLANT/ SAMPLE TYPE	DISEASE/ DISORDER	PATHOGEN	COUNTY
FRUIT CROPS			
Pear	Fire Blight	*Erwinia amylovora*	Dane
Peach	Peach Leaf Curl	*Taphrina deformans*	Dane
Strawberry	Crown/Root Rot	*Phytopthora* sp., *Rhizoctonia* sp., *Fusarium* sp.	Walworth, McHenry (IL)
	Winter Kill	None	Walworth, McHenry (IL)

For additional information on plant diseases and their control, visit the PDDC website at pddc.wisc.edu.

Berry Crops

The African fig fly in Wisconsin in 2017

By: Christelle Guédot and Janet van Zoeren, UW-Madison Department of Entomology

The African Fig Fly (AFF), *Zaprionus indianus* Gupta (Diptera: Drosophilidae; see image on page 2), is a newly invasive species of small fruit for Wisconsin. For more basic info on this fly, please refer to the article at the beginning of this issue. AFF was first detected in 2012 by a colleague at UW-Madison, John Pool, in the Genetics Department, in one of his Drosophila traps.

While we have been monitoring the invasive spotted wing drosophila (SWD) since 2013 and AFF is attracted to the same type of attractants and traps, we have not seen any AFF in our SWD monitoring until 2017.

In 2017, we started an experiment to assess the presence of SWD in different habitats led by our collaborators in Michigan. We surveyed raspberry crop, grape (as an alternate host for SWD), deciduous forests, pine forests, and riparian habitat. We monitored these traps for a 12-month period and during this time, we found AFF in some of these traps. AFF were found in all habitat types sampled (Fig 2), albeit in low numbers.

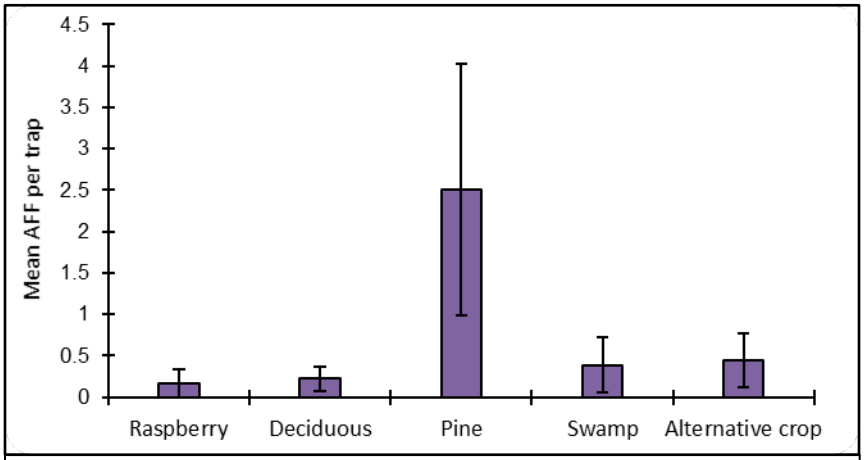


Figure 1. Average number (±SEM) of AFF in SWD traps in different types of habitats (alternate crop was grape in Wisconsin.

African fig flies were first caught on 7/4/17 in the pine and alternate crop (grape) habitats (Fig 3), and were last caught on 10/30/17 (in all habitats).

AFF is not expected to become a problem in Wisconsin fruit crops at this time. Their numbers are still very low and they are very unlikely to overwinter in Wisconsin and be able to build up their populations from overwintering individuals the next year. We will continue to monitor the presence of AFF in Wisconsin in our SWD traps and will let you know if the numbers increase in the coming years.

Happy Growing Season!

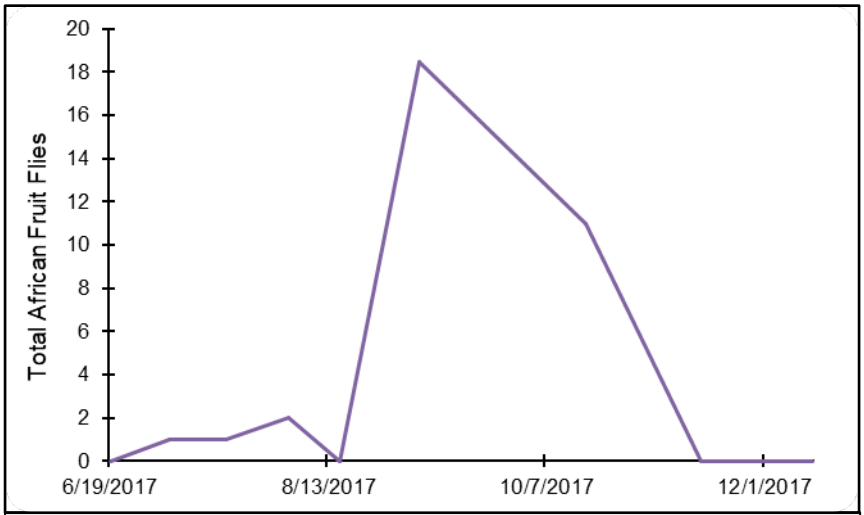


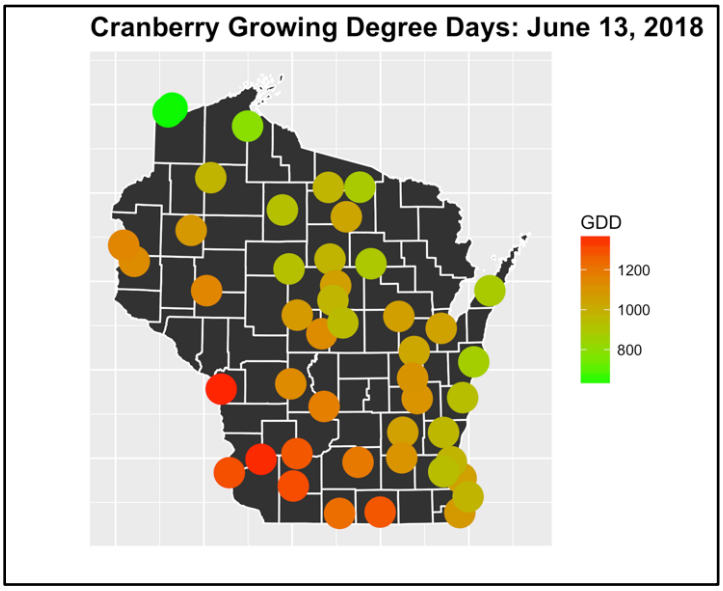
Figure 3. Total number of AFF caught in SWD traps for each week from 1st to last detection of AFF in the trapping season.

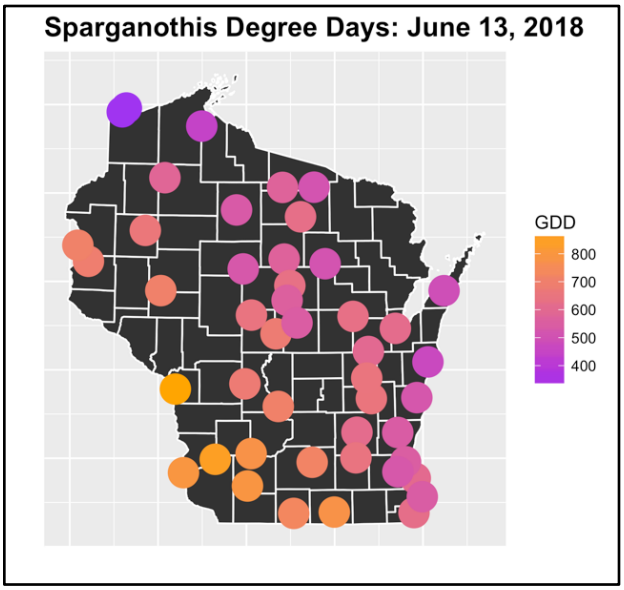
Cranberries

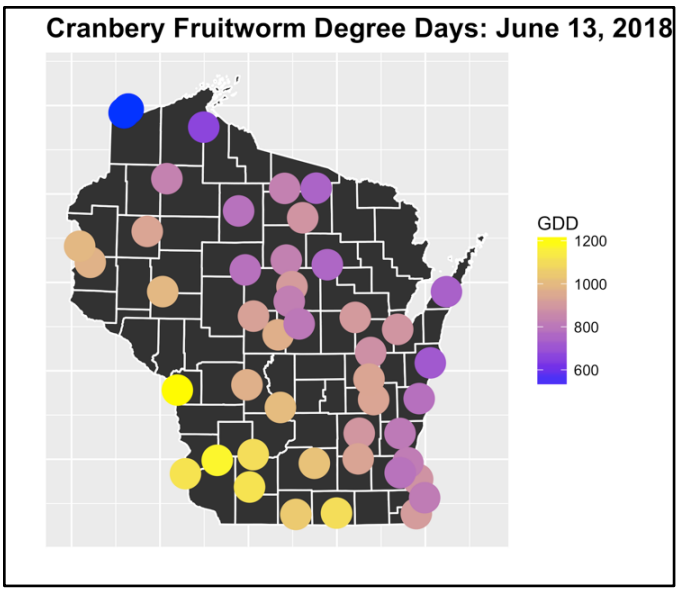
Cranberry plant and pest degree-days: June 13, 2018

By: Elissa Chasen and Shawn Steffan, USDA-ARS and UW Entomology

Check out the maps below for the degree-days of the cranberry plant and associated pests. Recall that degree-days are calculated based on the daily high and low temperature accumulations and that they vary by species according to species specific temperature thresholds. Developmental thresholds for each species are: cranberry plant - 41 and 85°F; sparganothis fruitworm - 50 and 86°F; and cranberry fruitworm - 44 and 87° F.







While two weeks ago, we were still behind last years' DD accumulations, we have now caught up. You can see that in the table below.

June 13	Cranberry DDs			Sparg DDs			CFW DDs		
	2016	**2017**	**2018**	**2016**	**2017**	**2018**	**2016**	**2017**	**2018**
Northern WI (Minocqua)	884.7	846.5	977.4	446.8	422	575.2	719.9	684.6	833.2
Central WI (Wisconsin Rapids)	1189.3	1146.1	1116.6	659	624.7	673.2	989.1	952.5	957

Moth flights have likely started at all Central WI sites and are predicted to do so in Northern WI, shortly.

Event	DDs from March 1 (approximate)
Flight initiation	595.7
First eggs laid	681.0
Peak flight	884.12
First egg hatched*	895.4
End of egg laying	1,634
Last egg hatched*	1,890

* Egg hatch window: 895 – 1,890 DDs

Crown gall of grapes

By: Denise Smith and Patty McManus

Crown gall on the base of a grapevine trunk. Photo courtesy of Bryan Hed, Penn State Extension.

What is it?

Simply put, the symptoms of crown gall are galls (abnormal growths or tumors) at or near the crown, or base, of the trunk. Sometimes galls develop higher up on trunks and rarely on cordons. The galls form at the site of an injury to the trunk or at graft unions. New galls appear in early summer as fleshy white growths on the trunk and become brown, corky masses as the summer proceeds. The galls can impede flow of nutrients between the roots and leaves and berries. This causes poor shoot growth and potential loss of the fruit crop. In severe cases, the flow of nutrients is cut off entirely and the vine dies.

The pathogen is spread in symptomless cuttings and by planting grapevines in previously infested soil. Most grapevines are probably colonized by the pathogen, but never display any symptoms. A wound to the trunk may send a chemical signal that causes the pathogen to begin actively causing disease. Cold winters are the cause of many trunk injuries. Even in winters that are relatively mild, repeated large and rapid temperature changes can be damaging to woody stems.

Crown gall on the upper part of the trunk.

What can I do about it?

Unlike most diseases of grapes that are caused by fungi, crown gall is caused by a bacterium called *Agrobacterium vitis*. Crown gall on most other woody plants is caused by the related species *Agrobacterium tumefaciens*. Fungicides do not control bacteria; they have no effect on crown gall. In theory, antibiotics should control the crown gall pathogen, but no antibiotic treatment has been found to be effective against this disease, and antibiotics are not registered for use on grapes. Biological control agents that are used to control crown gall on other crops do not work against grape crown gall.

Since there aren't any chemical controls available for crown gall of grapes, other forms of disease management need to be practiced.

- If possible, avoid establishing a new vineyard in an area that had previously been planted to grapevines. The pathogen can persist on roots and other debris in the soil from diseased plants previously grown on the site.
- Plant certified disease-free nursery stock.
- Plant cold-hardy cultivars. Freeze injuries of the trunk make plants susceptible to the development of galls. Vines in poorly drained soil are especially at risk, due to repeated freezing/thawing of wet ground. Because they lack cold-hardiness, *Vitis vinifera* cultivars are more susceptible to crown gall than cultivars derived primarily from American species or interspecific hybrid cultivars.

- Use a double or multiple trunk training system to minimize losses to crown gall. A diseased trunk can be removed and another trunk developed in its place. While there's a good chance that the new trunk will also eventually develop galls, this practice allows vines to remain productive.
- Take care to minimize damage to grapevine trunks when mowing, pruning, etc.
- When removing a vine with crown gall, remove as much of the root system as possible.
- Early summer, when galls are fresh, is the best time to diagnose crown gall. Samples can be submitted to the Plant Disease Diagnostic Clinic, 1630 Linden Drive, Madison, WI 53706. Your county extension office can also help you submit samples.

Recognizing synthetic auxin herbicide injury in grape vines

By: Jed Colquhoun, Professor and Extension Specialist, UW-Madison Department of Horticulture

Synthetic auxin herbicides, such as the active ingredients 2,4-D, dicamba and clopyralid, are not new. In fact, some of them are among the first commercially-available synthetic herbicide products dating back to development during World War II. Synthetic auxin herbicides target broadleaf weeds and are commonly used in cereal grains, turf, pastures, pre-plant burndown and right-of-way vegetation management. In a homeowner setting they're often found in "weed and feed" lawn fertilizer products.

So, if they're not new, why the renewed interest in them? There are two reasons: we've known for a long time now that grape vines are extremely sensitive to damage from low doses of these herbicides, and soybean has been recently modified to include resistance to 2,4-D and dicamba in an effort to combat glyphosate-resistant weeds. Soybean with the 2,4-D resistance trait is still in limited commercial production this season as export approvals are pursued, but dicamba-resistant soybean has been available for a couple of years and continues to increase in acreage.

Classic synthetic auxin herbicide injury in grapes, including cupped leaves, stunted growing points, twisted stems and leaf veins extended beyond the tissue between them.

With grape herbicide sensitivity and the potential for expanded synthetic auxin herbicide use in mind, it's worth a quick review of the exposure symptoms. Diagnosing off-target herbicide injury can be challenging and often confused with non-herbicide causes, such as chilling or frost damage and nutrient deficiencies.

These herbicides are synthetic versions of the growth hormones naturally produced in plants that regulate all growth stages, from germination and emergence to reproduction and plant senescence or death. When supplied in excess via herbicide application normal auxin distribution is disrupted and uneven, resulting in abnormal growth symptoms. Synthetic auxin herbicides are translocated or piped within the plant to growing points, often including root tips. Grape vines can exhibit injury symptoms (and potentially also raise herbicide residue concerns) for 2 to 3 years after exposure to higher doses as the herbicide persists and moves around the plant.

Common symptoms of grape vine exposure to off-target synthetic auxin herbicides include:

- Cupped or curling leaves, often with a rough or wavy surface
- Leaf veins that extend well beyond the tissue between them
- Twisted stems, sometimes to the point of cracking

- Aborted or stunted growing points with a "bonsai" appearance
- Reduced or eliminated fruit production (but noting that there could be many causes for reduced yield!)
- Predisposition to winter kill or spring injury as translocation within the plant is disrupted

These symptoms are often most visible in new growth, but keep in mind there is also a risk of fruit contamination with these herbicides that can negatively the ability to sell or distribute the resulting products.

Grape Variety Developmental Stages: June 15, 2018

By: Janet van Zoeren, Annie Deutsch, Jacob Scharfetter, and Amaya Atucha

At the West Madison Agricultural Research Station (WMARS), fruit is setting on all varieties, which range from E-L 27 ("bunch setting, at right angles to stem") to E-L 31 ("berries pea-sized, 7 mm diameter"). Phylloxera was seen for the first time this week in significant numbers, but still only affect less than 2% of leaves per vine, well below the economic threshold.

At the Peninsular Agricultural Research Station (PARS), varieties are all currently at E-L 17 ("inflorescence well developed"). Larval flea beetle has been seen feeding on leaves at PARS, and a single tumid gallmaker was found on a La Crosse variety vine.

E-L stands for Eichhorn-Lorenz Phenological stages to describe grapevine development

Following photos taken on June 11th at West Madison Agricultural Research Station.

Brianna at WMARS; "berries pea-sized (7 mm diameter)" E-L number = 31

La Crescent at WMARS; "berries peppercorn size, bunches tending down" E-L number = 29

La Crosse at WMARS; "bunch setting, at right angles to stem" E-L number = 27

Itasca at WMARS; "berries peppercorn size, bunches tending down" E-L number = 29

Marquette at WMARS; "berries peppercorn size, bunches tending down" E-L number = 29

Frontenac at WMARS; "berries peppercorn size, bunches tending down" E-L number = 29

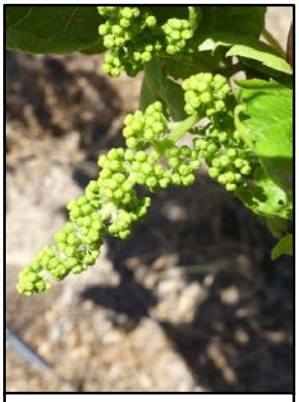
Foch at WMARS; "bunch setting, at right angles to stem" E-L number = 27

Petite Pearl at WMARS; "berries peppercorn size, bunches tending down" E-L number = 29

Following photos taken on June 13th at Peninsular Agricultural Research Station (PARS)

Brianna at PARS; "inflorescence well developed" E-L number = 17

La Crescent at PARS; "inflorescence well developed" E-L number = 17



La Crosse at PARS; "inflorescence well developed" E-L number = 17

Marquette at PARS; "inflorescence well developed" E-L number = 17

Frontenac at PARS; "inflorescence well developed" E-L number = 17

St Croix at PARS; "inflorescence well developed" E-L number = 17

Grape Growing Degree Days (Base 50, BE)

April 1 - June 14

	2018	2107	2016
WMARS	742	670	
PARS	474	391	381

The growing degree-day accumulations as of June 14th for this year are: 742 GDD at WMARS and 474 GDD at PARS. We have significantly passed the degree day accumulations from this date in 2017 and 2016.

We calculated degree-days using a base of 50°F, starting on April 1st as a biofix. "BE" (Baskerville-Emin) refers to a specific way in which to calculate degree days, using a sine wave instead of a simple average temperature calculation – this gives a somewhat more accurate estimation of degree days. We calculated degree days using the NEWA website, and you can visit their "About degree days" page to learn more about the formulas they use for their calculations (http://newa.cornell.edu/index.php?page=about-degree-days).

Tree Fruits

Codling moth management

By: Janet van Zoeren and Christelle Guédot, UW-Extension

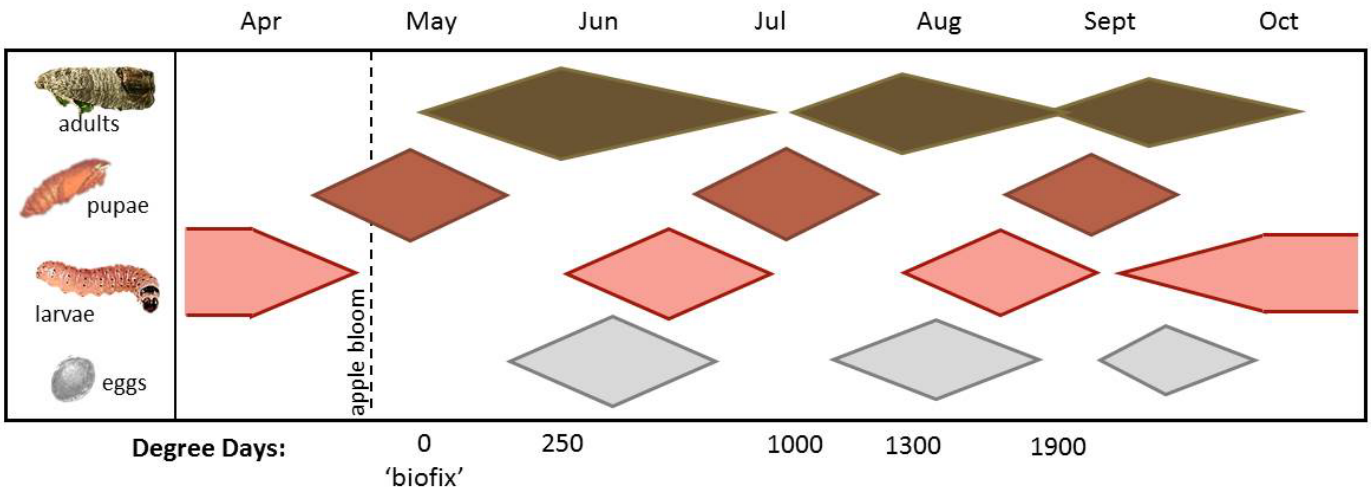
Across Wisconsin most regions have accumulated around 250 degree days (DD) since the start of the sustained codling moth flight, also known as biofix (late May in most orchards). This threshold of 250 DD indicates that larvae are beginning to hatch, and would be particularly susceptible to an insecticide application. A monitoring threshold of 10 moths per trap is used to determine if the population of codling moth is high enough at your orchard to warrant an insecticide application at this time. According to John Aue of Threshold IPM, unusually high trap catch numbers (30-70 moths per trap) were seen this May, possibly because the late, sudden spring caused populations to be more condensed temporally, instead of spread out across several weeks (see DATCP pest bulletin volume 63, number 6).

Codling moth. Photo courtesy of Ben Jaffe.

The following information on monitoring and on using insecticides to control codling moth was first published last year in volume 2, issue 4 of this newsletter. For information about using mating disruption to control for codling moth, please refer to that article.

Larval control is still an important aspect of codling moth IPM, and the effectiveness of a larvicide can be greatly increased by monitoring and using a degree day model to improve spray timing. If you are not using mating disruption this summer, you can monitor populations using a commercially available CM pheromone lure at a rate of one trap per ten

acres. Traps ideally should have been set out prior to bloom, at about head height in the tree canopies. It is especially important to check the traps every few days until you find the first "sustained trap catch", or when there is on average more than one moth per trap on two consecutive nights.



A graphical depiction of the codling moth life cycle, with degree day accumulation on bottom based on first sustained moth trap catch as a biofix, and using a base of 50°F to calculate degree days.

That date of first sustained trap catch is used for CM as a "biofix", or as the time when you begin accumulating degree days. First sustained trap catch represents the point at which moth flight begins, and therefore when egg laying begins. Approximately 250-300 degree days after this biofix the majority of the larvae will have hatched, but will not yet be inside an apple, which is the optimal time to spray a larvicide for CM. Degree days can be calculated using your own weather station data (see article explaining degree day calculations in the second issue of this newsletter), or a regional degree day accumulation can be found using the NEWA website and Cornell's CM model.

A list of available insecticides to control CM in apple is provided in the following table. There are many other tradenames available, and we do not recommend these that are listed above other options. All product recommendations can be found in the 2018 Midwest Fruit Pest Management Guide. Additionally, you should always fully read and follow the label before spraying any pesticide.

Class (IRAC code)	Tradename	Active ingredient	PHI (days)	Effectiveness
Physical deterrent (n/a)	Surround **(OMRI organic certified)**	Kaolin clay	0	Fair
Diamides (28)	Exirel **(Reduced risk)**	Cyantraniliprole	3	Excellent
	Altacor **(Reduced risk)**	Chlorantraniliprole	5	Excellent
Spinosyns (5)	Delegate **(Reduced risk)**	Spinetoram	7	Excellent
Benzoylureas (15)	Rimon	Novaluron	14	Excellent
Neonicotinoids (4A)	Assail	Acetamiprid	7	Excellent
Organophosphate (1B)	Imidan	Phosmet	7	Excellent

Calendar of Events

July 18, 2018 – Summer Apple Growers Field Day
8 am – 5 pm, Oakwood Fruit Farm, 31128 Apple Ridge Rd, Richland Center, WI

July 19, 2018 – WMARS Vineyard Walk
1 pm – 4:30 pm, West Madison Agricultural Research Station, 8502 Mineral Point Rd, Verona, WI

August 13, 2018 – PARS Vineyard Walk
1 pm – 4 pm, Peninsular Agricultural Research Station, 4312 Hwy 42 N., Sturgeon Bay, WI

Useful Links:

Wisconsin Fruit Website: https://fruit.wisc.edu/

You can purchase ($10) the 2016 Midwest Fruit Pest Management Guide from the UW Learning Store: http://learningstore.uwex.edu/Midwest-Fruit-Pest-Management-Guide-2016-P1785.aspx

Insect Diagnostics Lab: http://labs.russell.wisc.edu/insectlab/

Plant Disease Clinic: http://labs.russell.wisc.edu/pddc/

Soil and Forage Analysis Lab: https://uwlab.soils.wisc.edu/

Weed Identification Tool: http://weedid.wisc.edu/weedid.php

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