Wisconsin Fruit News

Volume 3, Issue 10 – August 24, 2018

General Information

UW-Madison/Extension Insect Diagnostic Lab update

By: PJ Liesch

A summary of fruit crop insects being reported to the UW Insect Diagnostic Lab over the last two weeks can be found below:

Reports of **Japanese beetles** continue to trickle in from around the state. Of recent interest were reports and observations of feeding damage on apples in the Hazlehurst area (Oneida County). Reports suggest that Japanese beetle populations are variable depending on your geographic location in the state.

Stink Bug reports have been steady from around Wisconsin. The commonest species being observed are the native "brown" and "dusky" stink bugs (*Euschistus* spp.), the "green" stink bug (*Chinavia hilaris*), and the brown marmorated stink bug (*Halyomorpha halys*). BMSB juveniles are being spotted regularly in parts of Dane County, while adults have been reported in southeastern and southcentral counties and the Fox River Valley corridor up to Brown County. BMSB was also recently documented in Marquette County for the first time.

Reports of **fall webworm** "tents" in fruit trees (apple and cherries) have been reported in central Wisconsin (Marathon County). This species has also been reported around the state in landscape trees recently.

Codling moth damage was observed in a home orchard setting in south central Wisconsin.

Activity of **yellowjackets** and other opportunistic scavengers (including **multicolored Asian lady beetles**) is expected to increase around the state in the near future as harvest time approaches.

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 Aug 4, 2018 through Aug 17, 2018.

PLANT/ SAMPLE TYPE	DISEASE/ DISORDER	PATHOGEN	COUNTY
FRUIT CROPS			
Apple (Unspecified)	Sooty Mold	Unspecified Sooty Mold Fungus	Ozaukee
Apple ('Cortland')	Apple Scab	Venturia inaequalis	Green
Apple ('Golden Delicious')	Cedar-Apple Rust	Gymnosporangium juniperi-virginianae	Green
Apple ('Honeycrisp')	Honeycrisp Leaf Chlorosis	None	Green
Apple ('Honeygold')	Necrotic Leaf Blotch	None	Green
Cranberry	Cranberry False Blossom	Cranberry false blossom phytoplasma	Wood
Grape ('Marquette')	Cytospora Canker	Cytospora sp.	Chippewa
Grape ('Marquette')	Herbicide Damage	None	Buffalo
Peach	Bacterial Canker	Pseudomonas syringae	Fond du Lac
Pear	Fire Blight Pear Scab	Erwinia amylovora Venturia pirina	Jefferson Dane
Raspberry	Raspberry Leaf Spot Root/Crown Rot Verticillium Wilt	Cylindrosporium rubi Phytophthora sp. Verticillium sp.	Waukesha Bayfield, Waukesha Bayfield
Rhubarb	Ascochyta Leaf Spot	Aschochyta sp.	Buffalo
Strawberry	Root/Crown Rot	Fusarium sp.	Chippewa

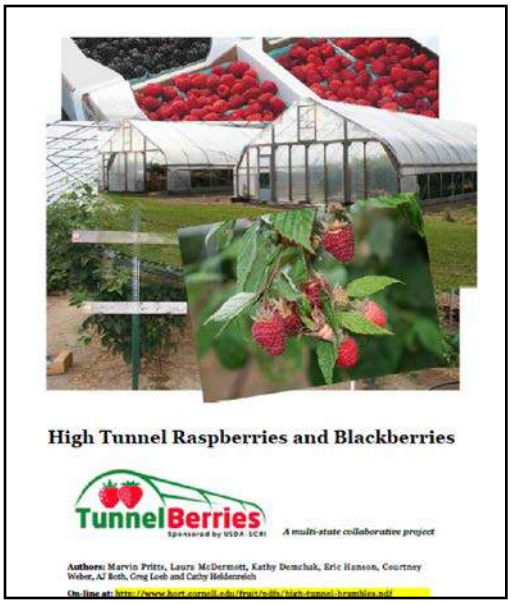
For additional information on plant diseases and their control, visit the PDDC website at pddc.wisc.edu.

Berry Crops

High Tunnel Raspberries and Blackberries Guide

By: Amaya Atucha

In my search for resources to share with the bramble growers, I found this excellent new guide on raspberry and blackberry production in high tunnels. The publication summarizes research results from an ongoing USDA-SCRI multistate funded project in the northeast region of the US. The guide covers topic on tunnel selection and construction, production systems, planting and plant selection, tunnel management, harvesting, pest control, and constructing budgets. You can download the guide for free at: http://www.hort.cornell.edu/fruit/pdfs/high-tunnel-brambles.pdf, or you can visit the project website where you will be able to find many other resources regarding berry production in high and low tunnels https://www.tunnelberries.org.



Leaf Tissue Analysis for Berry crops- Now is the time

By: Amaya Atucha, UW-Extension State Fruit Specialist

Leaf tissue analysis is the best indicator of plants' nutritional status as it measures directly the concentration of nutrients in the plant. Soil test can be a use tool as well, however results of soil test do not always correlate with the amount of nutrients that plants are actually up taking. A good recommendation for growers is to take foliar samples on an annual basis and a soil test every 3 years.

Foliar nutrient analysis is the best way to assess the effectiveness of your fertility program, as it allows growers to detect when nutrient levels in the plant are approaching deficiencies before visual symptoms are observed, allowing growers to take corrective action in advance. The analysis provides information on N, P, K, Ca, Mg, Fe, B, Mn, and Zn levels in leaves sampled and a guideline with the concentration range for these nutrients expected in healthy plants.

When and how should I collect the leaf samples?

The standard recommendation for foliar sample collection is mid-summer because during this time of the year nutrient levels are most stable in the plants.

For blueberries, 80 to 100 leaves should be collected from the middle section of shoots (not old leaves from the base, nor new leaves from the tip) selecting young newly matures leaves fully exposed to the sun. For blackberries and raspberries, collect a minimum of 50 fully expanded leaves from primocanes (non-fruiting canes). For strawberries a minimum of 50 leaves should be collected from first fully expanded leaves after renovation.

A general recommendation is to collect the leaves across the planting in a zigzag pattern. Leaves should be sampled from plants that are representative of the entire field, and separate samples should be collected from areas where plants have poor growth or present visual symptoms of nutrient deficiencies.

Once you have collected the leaves, gently wash them with distilled water to rinse off soil and spray residues, and let them air dry. Place the leaves in a clearly labeled paper bag and send them to the lab. If you cannot wash the leaves after collecting them, place them in a cooler or refrigerator until you can process them (do not allow leaves to wilt before you wash them).

As a reference we are providing tables with the desired range of nutrient concentrations for blueberries, brambles, and strawberries.

Critical nutrient foliar concentration for Blueberry (source: Penn State University)

Element	Deficient	Below Normal	Normal	Above Normal	Excessive
N (%)	1.65	1.7	1.9	2.1	>2.1
P (%)	0.05	0.06	0.1	0.18	>0.18
K (%)	0.35	0.4	0.55	0.65	>0.65
Ca (%)	0.35	0.4	0.6	0.8	>0.80
Mg (%)	0.18	0.2	0.25	0.3	>0.30
Mn (ppm)	45	50	250	500	>500
Fe (ppm)	65	70	200	300	>300
Cu (ppm)	4	5	11	15	>15
B (ppm)	29	30	40	50	>50
Zn (ppm)	14	15	25	30	>30

Critical nutrient foliar concentration for Brambles (source: Cornell University)

Element	Deficient	Below Normal	Normal	Above Normal	Excessive
N (%)	1.80	2.00	2.50	3.00	>3.00
P (%)	0.23	0.25	0.35	0.40	>0.40
K (%)	1.45	1.50	2.00	2.50	>2.50
Ca (%)	0.57	0.60	1.70	2.50	>2.50
Mg (%)	0.27	0.30	0.70	0.90	>0.90
Mn (ppm)	45	50	150	200	>200
Fe (ppm)	48	50	150	200	>200
Cu (ppm)	6	7	30	50	>50
B (ppm)	28	30	40	50	>50
Zn (ppm)	18	20	35	50	>50

Critical nutrient foliar concentration for Strawberries (source: Cornell University)

Element	Deficient	Below Normal	Normal	Above Normal	Excessive
N (%)	1.50	1.80	2.00	2.80	>2.80
P (%)	0.20	0.25	0.35	0.40	>0.40
K (%)	1.20	1.50	2.00	2.50	>2.50
Ca (%)	0.60	0.70	1.50	1.70	>1.70
Mg (%)	0.25	0.30	0.45	0.50	>0.50
Mn (ppm)	40	50	150	250	>250
Fe (ppm)	50	60	150	250	>250
Cu (ppm)	5	7	10	20	>20
B (ppm)	20	30	60	70	>70
Zn (ppm)	15	20	35	50	>50

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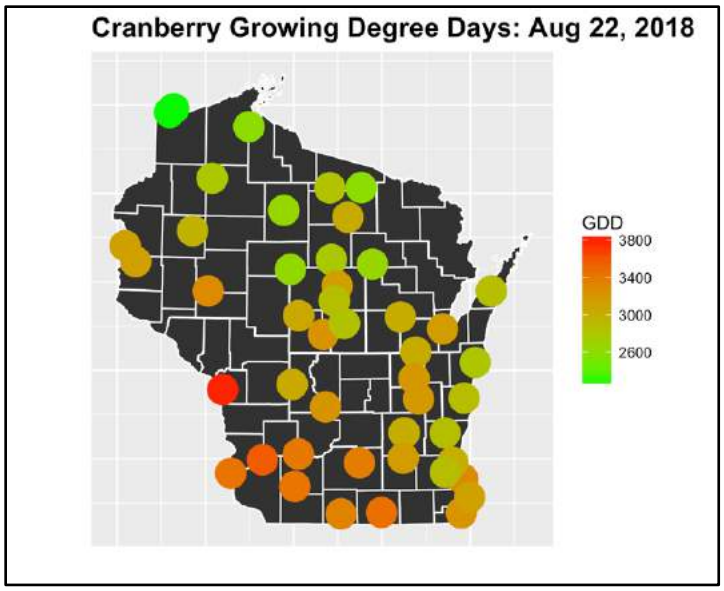
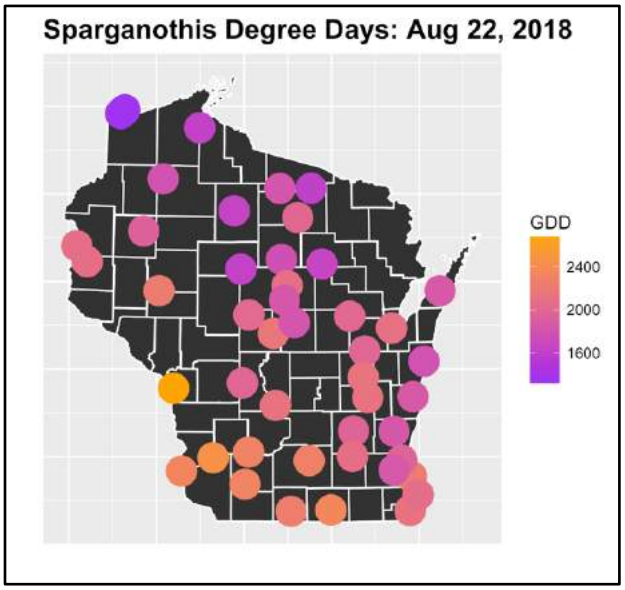
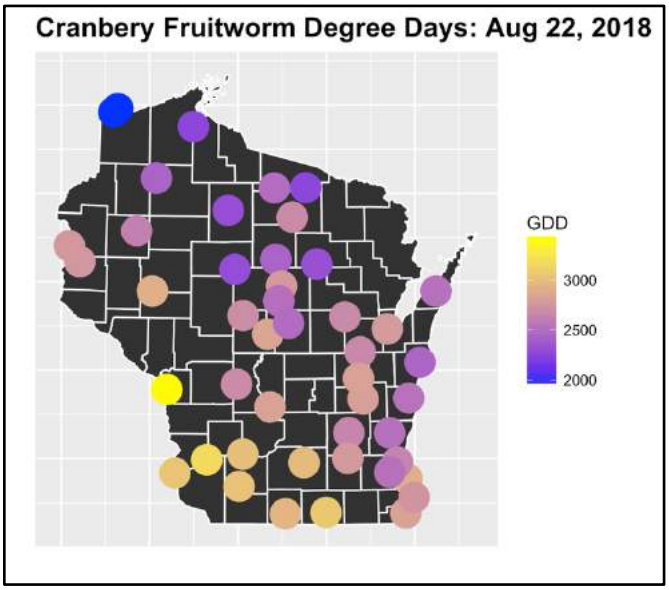
Cranberry plant and pest degree-days: August 22, 2018

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.[1]







Use the table below to compare degree-day accumulations for all three organisms across the last couple of years and between Northern and Central WI.

Aug 22	Cranberry DDs			Sparg DDs			CFW DDs		
	2016	2017	2018	2016	2017	2018	2016	2017	2018
Northern WI (Minocqua)	2746.2	2493	2880.9	1682.3	1445.5	1849.6	2371.4	2121.1	2526.7
Central WI (Wisconsin Rapids)	3304.3	3084.6	3285.6	2144.2	1935.1	2212.2	2894.1	2681	2916

[1] 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.

Grape Variety Developmental Stages: Aug 23, 2018

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

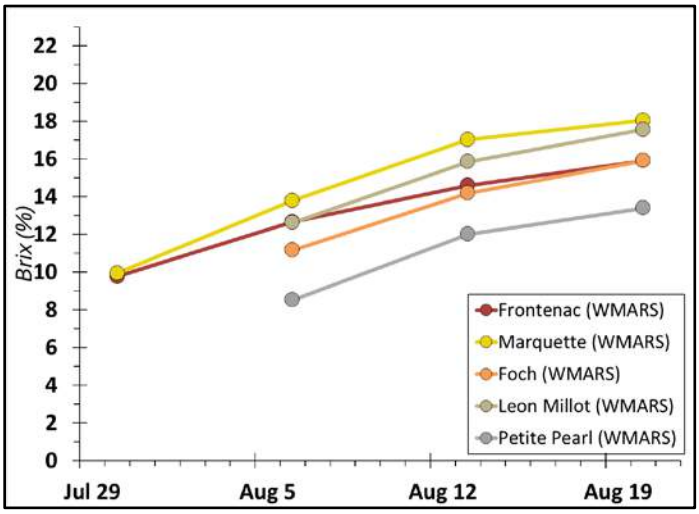
Dane County:

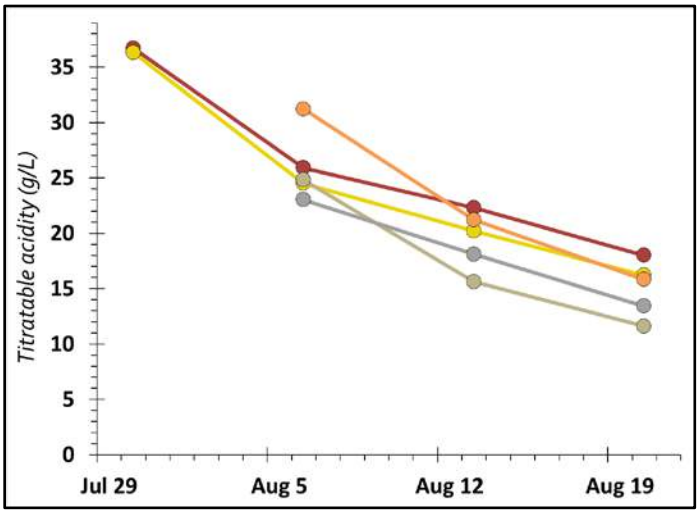
At the West Madison Agricultural Research Station (WMARS) Brianna has reached our target maturity levels, and was harvested on 8/23. The other cultivars continue to ripen steadily, although we do expect a slower maturity rate due to the cool and wet weather we are expecting. All remaining cultivars are currently at either developmental stage E-L 36 ("berries with intermediate sugar") or 37 ("berries not quite ripe"). Sugar (Brix) and TA (titratable acidity) concentrations as of August 20th are shown in the chart below, along with graphs below to track their progression throughout the ripening period.

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

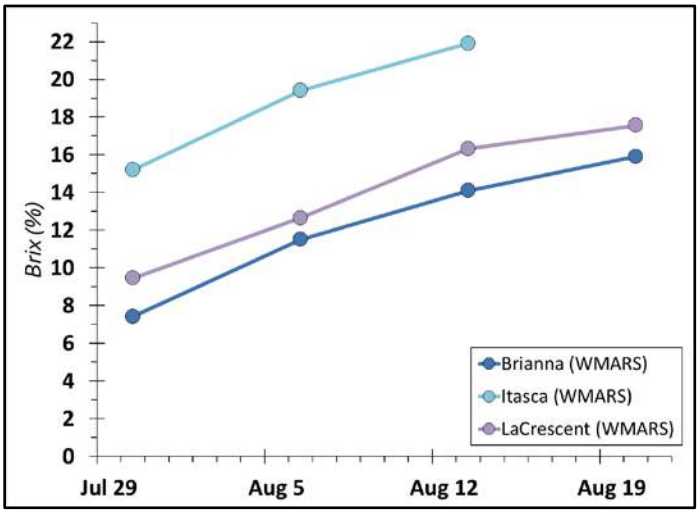
Aug 20, 2018 **Grape Brix and Titratable Acidity (TA)**

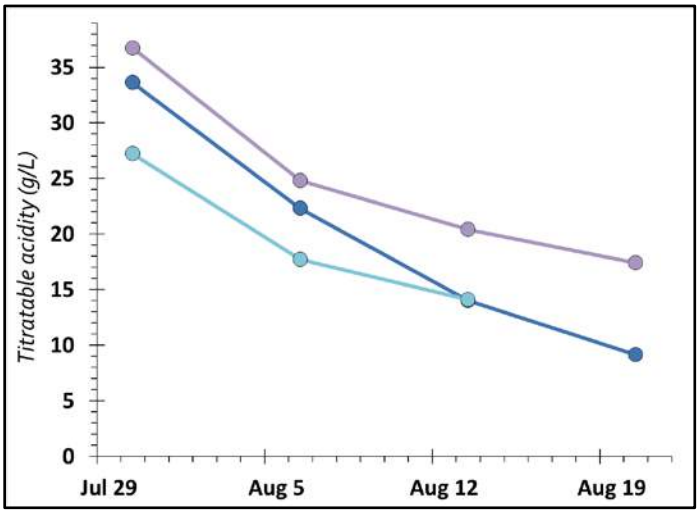
	WMARS	
Grape Variety (Reds)	**Brix (%)**	**TA (g/L)**
Frontenac	15.0	18.0
Marquette	18.0	16.2
Foch	15.9	15.8
Leon Millot	17.6	11.6
Petite Pearl	13.5	13.4
Grape Variety (Whites)	**Brix (%)**	**TA (g/L)**
Brianna	HARVESTED at 15.9	HARVESTED at 9.1
Itasca	HARVESTED at 21.9	HARVESTED at 14.1
La Crescent	17.6	17.4





Brix (above left) and Titratable acidity (above right) of red wine grape varieties as WMARS.





Brix (above left) and Titratable acidity (above right) of white wine grape varieties as WMARS.

Following photos taken on Aug 20th at West Madison Agricultural Research Station.

Brianna at WMARS;
"berries harvest-ripe"
E-L number = 38

La Crescent at WMARS;
""berries with
intermediate sugar"
E-L number = 36

La Crosse at WMARS;
"berries not quite ripe"
E-L number = 37

Itasca at WMARS;
"berries harvest-ripe"
E-L number = 38

Marquette at WMARS;
"berries not quite ripe"
E-L number = 37

Frontenac at WMARS;
"berries with
intermediate sugar"
E-L number = 36

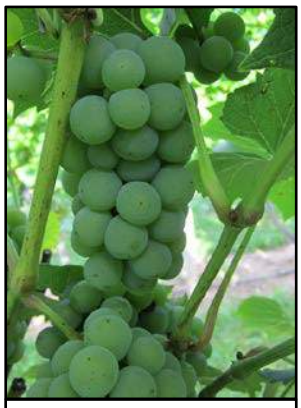
Foch at WMARS;
"berries not quite ripe"
E-L number = 37

Petite Pearl at WMARS;
"berries with
intermediate sugar"
E-L number = 36

Door County:

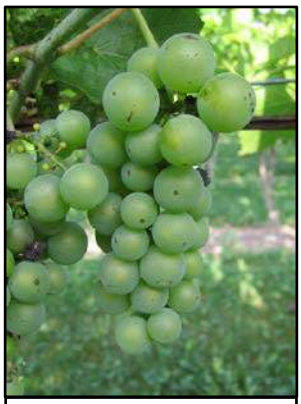
At the Peninsular Agricultural Research Station (PARS), berries have moved beyond the second "lag" stage of development, and now sugar levels are increasing and acidity decreasing. All cultivars are now at developmental stage E-L 36 ("berries with intermediate sugar").

Following photos taken on Aug 22nd at Peninsular Agricultural Research Station (PARS)



Brianna at PARS;
"berries with
intermediate sugar"
E-L number = 36

La Crescent at PARS;
"berries with
intermediate sugar"
E-L number = 36



La Crosse at PARS;
"berries with
intermediate sugar"
E-L number = 36

Marquette at PARS; "berries with intermediate sugar" E-L number = 36

Frontenac at PARS; "berries with intermediate sugar" E-L number = 36

St Croix at PARS; "berries with intermediate sugar" E-L number = 36

Growing degree days:

April 1 - Aug 23	Grape Growing Degree Days (Base 50, BE)	
	2018	2107
WMARS	**2259**	1969
PARS	**1802**	1514

The growing degree-day accumulations as of Aug 23rd for this year are: 2,259 GDD at WMARS and 1,802 GDD at PARS. We continue to be "ahead" of where we were on this date in 2017 at both locations in terms of degree day accumulations, and correspondingly, all cultivars have higher Brix and lower acidity than at this time last year. 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).

Botrytis bunch rot of grapes
(Or, what's happening to my beautiful grapes??)

By: Denise Smith and Patty McManus

According to the *Compendium of Grape Diseases, Disorders, and Pests*, Botrytis bunch rot (AKA gray mold) "is most severe in regions experiencing moderate temperatures and rainfall or extended periods of high humidity between veraison and harvest". Sounds like the Midwest! Unfortunately, many wine grape and table grape cultivars are at least somewhat susceptible to Botrytis bunch rot. This disease is often an unwelcome surprise at the end of the growing season just when you thought you were going to have a beautiful crop of grapes to harvest.

Botrytis bunch rot on white grapes. Photo courtesy of Ontario GrapeIPM.

What is it?

Botrytis bunch rot is caused by a fungus, *Botrytis cinerea*, that is ubiquitous worldwide and causes disease on many other plants in addition to grapes. It can also survive on dead plant tissues. The fungus spreads among plants by producing spores that are blown by the wind.

Botrytis bunch rot on red grapes. Photo courtesy of Laboratorio Enologico Toscano.

Within the grapevine canopy, spores also are spread when diseased tissues physically touch healthy tissues (e.g., from one berry to the next within a cluster). Infection occurs in favorable conditions, i.e. temperatures between 59 and 77°F and in the presence of rain or dew or very high relative humidity for an extended time. Young leaves, clusters, and shoots of grape vines may be infected early in the growing season. Any disease at this time will cause minimal damage but may provide spores to infect flowers. From bloom to berry touch young fruit clusters are highly susceptible to infection; these infections usually remain dormant until the fruit ripens or is harvested. As the berries ripen, they lose resistance to the fungus. An early symptom of berry infection is called "slip skin"; the berry skin appears shiny and is easily separated from the berry flesh when rubbed. Later, the fungus appears on the surface of berries as tufts of gray to gray-brown fuzz. The tufts of fuzzy fungal growth distinguish Botrytis bunch rot from black rot and Phomopsis rot. The disease causes the berries of white cultivars to turn brown and the berries of red or purple cultivars to turn red. *Botrytis cinerea* can also remain dormant in the fruit clusters until after harvest, and then cause significant damage to fruit during transport or in storage. The fungus survives the winter as a hardened survival structure on canes and on leaf and fruit debris.

Winemakers sometimes use Botrytis bunch rot to their advantage. For certain cultivars and under certain weather conditions (foggy evenings and mornings and sunny afternoons), berries infected with *Botrytis cinerea* and no other fungi can develop "noble rot." This fruit is used to make certain styles of sweet white wines.

How do I manage Botrytis bunch rot?

Because the fungal spores are present everywhere, it is not possible to exclude the fungus from your vineyard entirely. However, you can minimize the possibility of infections in your grapes by following these management practices.

- When establishing a vineyard, choose cultivars that are not highly susceptible to Botrytis bunch rot and that produce loose fruit clusters. A Review of Cold Climate Grape Cultivars which lists characteristics including disease susceptibility may be helpful in choosing cultivars.
- Increasing air circulation through the canopy is very important; practices such as proper shoot positioning, leaf thinning and hedging can help avoid prolonged periods of wetness or high humidity in the canopy.

- Apply an appropriate fungicide at bloom, bunch close, veraison, and pre-harvest. See the 2018 Midwest Fruit Pest Management Guide for information on effective fungicides.
- Reduce the opportunity for damage to the berries by using netting to exclude birds and taking care when performing any canopy management near the fruit.
- Remove fallen leaves and berries from the vineyard in the fall and canes from dormant pruning to reduce buildup of inoculum that may infect the vines in the spring.

Tree Fruits

Brown marmorated stink bug trapped in Dane County apple orchards

By: Janet van Zoeren and Christelle Guédot

Brown marmorated stink bug (BMSB) is an invasive pest of many fruits, vegetables, native trees, and ornamentals in Wisconsin. Krista Hamilton at DATCP just reported the presence of BMSB in Marquette County, making this a first record for this county. Although BMSB has been found in urban areas in Wisconsin since 2010, the summer of 2016 is the first time BMSB was trapped in Wisconsin crops (apples and pumpkins). As a side note, Christelle has a trap at her house in Monona and the numbers there have dramatically increased this year, especially this month, forecasting an interesting fall for crop damage and nuisance problems in Madison and possibly other urban areas.

Brown marmorated stink bug adult. Photo courtesy of Susan Ellis, Bugwood.org.

During the previous two week period, in multiple Dane County apple orchards, we caught an average of four BMSB per clear sticky trap. Unfortunately, we have been checking the traps every other week, so do not know when these were caught. Our black pyramid trap, set at one of those sites, still has not caught BMSB this summer.

In both 2016 and 2017, our first summer-generation (not overwintering) adult was caught in mid- to late August, similarly to what we saw this week. However, in previous years, densities started very low, with an average of less than one per trap. From the already elevated numbers of BMSB in traps in apple orchards, along with some seen in the orchards while scouting, we can expect that numbers will be higher this season than they were in previous years. In general, populations seem to peak in mid-October in our monitored apple orchards.

We strongly recommend you begin to monitor for BMSB in your orchard next year, if you haven't done so already. There is much more information about monitoring for BMSB in the resources listed below, including information about the two most common trap types: the clear sticky panel and the black pyramid trap. The advantage of the clear sticky panel traps is that we get much higher numbers of BMSB on those traps, so you will be more likely to have earlier detection and to know earlier in the season if you have the pest in your orchard. However, the advantage of the black pyramid trap is that research has been done to find an economic threshold for trap catch numbers with the black pyramid traps (which has not yet been done for the sticky traps), so you can tie pyramid trap numbers to helping make a decision if a spray will be necessary. As a reminder, the threshold used in other states for BMSB in apple is 10 adults per black pyramid trap per week (count adults found both on or in the trap).

Given that we have not yet caught BMSB in the pyramid trap, we are not yet near the economic threshold in any of the orchards we have been monitoring in. However, numbers do continue to increase, and we highly recommend you visit the stopbmsb.org webpage, or read our extension publication "Brown Marmorated Stink Bug: An invasive insect pest" if you would like to learn more about identification, monitoring, or controlling for BMSB.

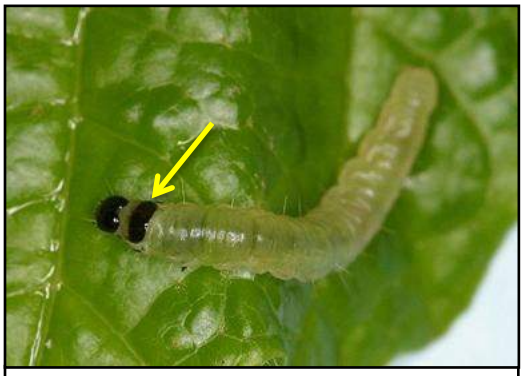
Oblique banded leaf roller

By: Janet van Zoeren and Christelle Guédot

We are in the middle of the second flight of the oblique banded leaf roller (*Choristoneura rosaceana*, OBLR), and, according to the DATCP Wisconsin Pest Bulletin, moths have begun laying eggs of the second generation. This means we will soon begin to see caterpillars from the final generation of OBLR of the season. We already covered this pest briefly last spring (WFN season 2, issue 2), when we discussed spring caterpillars. Here we focus on the summer and fall feeding damage by this pest.

Damage: OBLR feeds on a wide range of hardwoods, including apple, pear, cherry, and peach. There are three OBLR caterpillar feeding periods in Wisconsin orchards: spring caterpillars mainly feed on flower buds, summer caterpillars mainly feed on developing fruit, and late summer/fall caterpillars feed on both fruit and foliage. Mid-summer fruit feeding damage causes obvious deformation of the fruit, generally making it unmarketable. Late summer fruit feeding causes pits to form in the skin of the fruit, somewhat similar to the "stings" of unsuccessful codling moth entry, which are not obvious until the fruit is in storage, when rot may enter through the damaged skin.

Description and Life Cycle: OBLR has two generations per season in Wisconsin, with caterpillars present and feeding in orchards in early spring, again in mid-summer, and a final hatch of caterpillars in the fall (which will overwinter and continue to feed the following spring). OBLR caterpillars can be distinguished from other fruit tree leaf rollers by the light green body combined with the brown/black coloring on both the head capsule and the prothoracic shield (the body segment behind the head capsule; yellow arrow). The fall caterpillars we will see soon will feed on foliage and fruit for a while, before overwintering as second or third instar larvae inside a protective structure called a hibernaculum in the bark or other protected areas in the tree canopy.



Oblique-banded leafroller caterpillar. Photo by Todd M. Gilligan and Marc E. Epstein, TortAI, USDA APHIS ITP, Bugwood.org.

OBLR moths are ½ inch long. Their color ranges from reddish-brown to beige, with crisscrossing brown bands. The eggs are laid in egg masses of up to 200 eggs on the top side of foliage, and are light green in color, darkening as the larvae near hatching.

Oblique-banded leafroller adult. Photo by Mark Dreiling, Bugwood.org.

Monitoring and control: Monitoring traps can be set out using the commercially available P2 sticky traps and pheromone OBLR lures. It is recommended to set approximately one trap per 10 acres of orchard. Traps should be set at about eye height in the canopy of the apple trees and should be checked one to two times per week until the first moths are caught.

Cultural control can be used to keep the canopy and fruit less attractive to OBLR. Because these caterpillars prefer to feed in dense foliage or in the crevice between two touching apples, it can help to avoid excessive nitrogen applications, and to thin fruitlets adequately in the spring.

Chemical control windows occur when caterpillars are present in the orchard. In the fall, it is recommended to consider an insecticide application when 3-5% of fruit has OBLR feeding damage, which will help control the population for the following summer. It is difficult to set a simple threshold for when to spray based on monitoring trap catch numbers, because high trap numbers do not necessarily reflect high fruit damage. However, as a rule of thumb, 15 or fewer moths per trap per week is considered to be low enough numbers to not require an insecticide application.

If spraying for OBLR is necessary, check the 2018 Midwest Fruit Pest Management Guide for chemical control recommendations. It is especially important to be diligent about rotating mode of action classes when applying insecticides for OBLR, as some populations have already developed resistance to organophosphates and pyrethroids. As always, read the label before applying any insecticide, and be cognizant of unintended effects on beneficial insects including pollinators and natural enemies.

Calendar of Events

September 6, 2018 – Women Caring for the Land Workshop
8:30 am – 3 pm, Green Briar Farm, W936 County Rd N, Colby, WI

September 12, 2018 – Women Caring for the Land Workshop
8:30 am – 3 pm, Bossie Cow Farm, W6178 County Rd SS, Random Lake, WI

November 14, 2018 – Two Apple Farm Organic Apple Field Day
1 pm – 3:30 pm, Two Onion Farm, 19638 Cottage Inn Road, Belmont, WI

There are more "Women Caring for the Land" Workshop dates and locations. Please see the events section of our website for more information about this series.

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

Edited by: Christelle Guédot, Entomology Specialist, UW-Madison and Amaya Atucha, Horticulture Specialist, UW-Madison. *Formatting by:* Janet van Zoeren, Fruit Crops Extension Intern, UW-Extension. Articles provided by other sources as attributed. Funding provided by the University of Wisconsin-Extension. *Email Questions to:* vanzoeren@wisc.edu.