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UNIVERSITY OF WISCONSIN-MADISON

Wisconsin Fruit News

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In This Issue:

General Information

NEWA announces new weather monitoring partnership

By: Elizabeth DiNovella

If growers want to use the Network for Environment and Weather Applications (NEWA) website to run models to predict insect and disease infections they had to have a RainWise weather station in their orchards or vineyards. But now there's another choice for weather stations. NEWA is partnering with Onset Corporation and its HOBO RX3000 weather station.

Combining HOBO RX3000 weather stations with NEWA's decision support tools will give farmers access to microclimate monitoring data and real-time crop management decision support, allowing for faster, well-informed farm management decisions. Growers simply select the NEWA data feed after logging onto the HOBOlink® cloud platform and then contact the NEWA Help Desk to complete the onboarding process to http://newa.cornell.edu.

New Malusim Phone App Released

By: Elizabeth DiNovella

A new phone app of the thinning models (carbohydrate model and fruit growth rate model) and the apple irrigation model has been officially released. Growers can download the Malusim app at the Google Play Store, iTunes, or can access the app from any browser at https://malusim.org .

Please note that any growers who used the 2018 beta version of the Malusim app for Android must uninstall the 2018 version before downloading the new version. The data storage method is different. Changes made to data in the old app will not be accessible via the new app on any of the supported platforms.

When entering data for this year, growers should clone any existing locations and not simply edit them and updating the year. Cloning locations will allow access to historical data in the future.

malusim.org

UW-Madison/Extension Insect Diagnostic Lab update

By: PJ Liesch, UW Insect Diagnostic Lab

Despite an unusually late snow storm in southern Wisconsin, insect activity has been steadily picking up around the state over the last two weeks. A summary of fruit crop insects coming into the UW Insect Diagnostic Lab (IDL) over the last two weeks can be found below:

Spring Caterpillars: a number of spring caterpillars affect fruit crops as well as landscape trees and shrubs. In southern Wisconsin, the first reports of Eastern Tent Caterpillars have come into the diagnostic lab. Gypsy moth eggs have also likely begun to hatch. Cooler parts of the region with fewer accumulated growing degree days will lag behind, but growers should be on the lookout for these two common fruit tree pests. Other common species like the speckled green fruitworm and the humped green fruitworm have not yet been reported to the IDL for the year, but are also likely beginning to become active and have to potential to damage tree fruit. A report of large numbers of variegated cutworms recently came in from SE Wisconsin. While the variegated cutworms in this case had been observed in a greenhouse setting, this species commonly occurs outdoors and is known to feed on a wide variety of crops, including some fruits. Caterpillar activity and reports are expected to increase in the coming weeks as growing degree days continue to accumulate.

Grape Flea Beetle: a first report of grape flea beetle recently came into the UW Insect Diagnostic Lab for the year from southern Wisconsin. The Wisconsin Pest Bulletin also indicated that grape flea beetle activity has been noted for two or more weeks in some areas. This insect can cause notable damage to emerging grape buds, so grape growers should be keeping a close watch for this insect.

Spring Pollinators: Pollinator activity is rapidly increasing in the state, including many reports of solitary ground nesting bees and "tube" nesters such as mason bees. With bloom approaching in some parts of the state, growers should use caution while spraying to minimize risks to pollinators.

Berry Crops

Controlling mites in berries: what are some insecticide options?

By: Christelle Guédot, UW-Madison Department of Entomology

Most fruit growers have to deal with mites. Whether you experience European red mites (ERM), two-spotted spider mites (TSSM), cyclamen mites (CM), or rust mites (RM), to name the main culprits, in your fruit plantings, you should be aware that there are several products that can be used to control mites and that the timing and efficacy vary with each product. Michigan State University researchers John Wise, Rufus Isaacs, and Larry Gut recently summarized several key variables among miticides that can help determine which to use in your IPM program. A short version of their table is summarized below for berries and the full article can be found here for other crops, including pome and stone fruits, as well as grapes.

Compound	Fruit crop	Mites	Life stage target	Seasonal timing	Residual control
Superior, Stylet Oils	All fruit crops	ERM, RM	egg/larvae	Early (pre-bloom)	2-6 weeks
Lime-Sulfur	Blueberry	RM	motiles*	Early (delayed-dormant)	2-6 weeks
Savey	Caneberry, strawberry	TSSM	Egg/larvae	Mid (or threshold)**	6-8 weeks
Agri-Mek, ABBA	Strawberry	TSSM	Motiles*	Mid (or threshold)	6-8 weeks
ABBA	Strawberry	ERM, RM	Motiles*	Early***	8-12 weeks
		TSSM	Motiles*	Mid (or threshold)	6-8 weeks
Zeal	Strawberry	TSSM	Egg/larvae	Mid (or threshold)**	6-8 weeks
Kanemite	Strawberry	TSSM	Motiles*	Mid (or threshold)	6-8 weeks
Acramite, Banter	Strawberry	TSSM	Motiles*	Mid (or threshold)	6-8 weeks
Danitol	Strawberry	TSSM	Motiles*	Mid (or threshold)	4-6 weeks
Brigade	Strawberry, caneberry	TSSM	Motiles*	Mid (or threshold)	4-6 weeks
Hero	Blueberry, caneberry, strawberry	TSSM	Motiles*	Mid (or threshold)**	4-6 weeks
Oberon	Strawberry	TSSM	Eggs, motiles*	Mid (or threshold)	4-6 weeks
Vendex	Caneberry, strawberry	TSSM	Motiles*	Mid (or threshold)	4-6 weeks

* Motile forms include mite larvae, nymph and adult stages.
** Optimally used petal fall through August when mites reach threshold.
*** Optimally used petal fall through second cover.

I discussed mites in strawberry in more detail in a previous issue of the WFN.

Happy growing season!

Grapes

Grape Variety Developmental Stages: May 10, 2019

By: Jacob Scharfetter, Annie Deutsch, and Amaya Atucha

At the West Madison Agricultural Research Station (WMARS) in Madison, WI, shoot development across most cultivars' buds were in E-L stage 4 ("Initial Budburst"), with some buds in E-L stage 3 ("woolly bud with green showing") and in E-L stage 5 ("Advanced Budburst"). Currently, grapevine buds are phenologically on par with the 2017 and 2018 seasons. At the Peninsular Agricultural Research Station (PARS), all varieties are still at E-L stage 2 ("bud swell"), and no flea beetles have been reported yet.

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

The exceptionally cold temperatures experienced in January of this year have resulted in some bud and cordon injury in less cold hardy cultivars (e.g., Leon Millot and Marechal Foch). A week or two after budburst it is important to look at the shoots of your vines to see which buds have 'pushed' from either primary (typically highly fruitful), secondary (less fruitful), or tertiary (no fruit) buds. This quick assessment can provide you an idea of the extent the winter injury and rough estimate of your vineyard's fruiting capacity for this year. Please see Tim Marinson's article from Cornell University for more information on managing winter-injured vines.

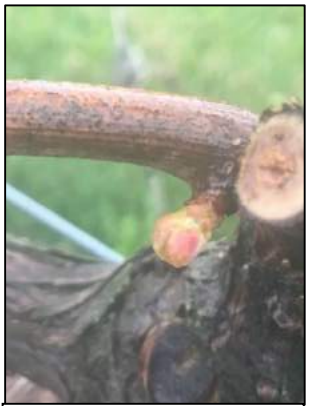
Following photos were taken on May 8, at West Madison Agricultural Research Station

Brianna
"Initial Budburst"
E-L stage 4

Crimson Pearl
"Advanced Budburst"
E-L stage 5

Frontenac
"Initial Budburst"
E-L stage 4

Itasca
"Advanced Budburst"
E-L stage 5



La Crescent
"Initial Budburst"
E-L stage 4

Marquette
"Initial Budburst"
E-L stage 4

Petite Pearl
"Initial Budburst"
E-L stage 4

Date: April 1 – May 10, 2019

Growing Degree Days (Base 50°F)

	2019	2018	2017
Location: WMARS	84	159	103
Location: PARS	18	50	22

Growing degree-day accumulation from April 1 to May 10 for the past three seasons. Currently, the 2019 season is running behind in GDD accumulation compared to 2017 and 2018 seasons. Degree-days were calculated using a base 50°F, starting on April 1 as a biofix. We calculated degree days using the NEWA website, and you can visit their "About degree days" page to learn more about the degree days and the formulas used for their respective calculations (http://newa.cornell.edu/index.php?page=about-degree-days).

Watch for grape flea beetles

By: Christelle Guédot, UW-Madison Department of Entomology

As I write this article, we have no report of grape flea beetle or any other insect observed at the West Madison or Peninsular Agricultural Research Stations. Scouting at West Madison on Thursday May 9th was conducted on a rainy and cloudy day which may explain the lack of flea beetle adult activity during the scouting. Since I wrote the last article two weeks ago, the weather has been much cooler and rainier than I had hoped for, which likely extended the period of bud swell as well as flea beetle activity (Photo 1). You should continue scouting your vineyard for flea beetle adult (photo 1) on or near the buds, as well as scout for bud damage (photo 2) until buds have reached ½ inch in size. Scout at least 25 vines throughout a block and count the number of damaged buds. I previously reported 2-5% buds damaged as a threshold for an insecticide application and this range is due to the difference between cultivars and training systems. Considering that flea beetle rarely causes significant damage to grape and based on your previous year experience, you may be able to tolerate a 4-5% threshold before applying an insecticide treatment.

1. Adult flea beetle feeding on swollen grape bud. Photo credit: Dean Volenberg, UW-Extension

2. Damage to swollen grape bud from adult flea beetle feeding. Photo credit: Dean Volenberg, UW-Extension

Thanks to Jacob Scharfetter and Annie Deutsch for scouting at the research stations.

Happy growing season!

Impact of rain on fungicides

By: Patty McManus, UW-Madison Department of Plant Pathology

It's no secret that rainy weather favors plant diseases caused by fungi, bacteria, and water molds (e.g., Phytophthora root rot of many crops or leather rot of strawberry). It's also not surprising that rain is a major factor that decreases the efficiency of fungicides. It's difficult to spray during rain. Aside from being uncomfortable if you're not covered, the ground is often soft and slippery, making spraying dangerous on uneven or sloped land. Also, rain washes fungicide residues from leaves to varying degrees, depending on the type of fungicide and intensity and duration of the rain.

Contact fungicides such as captan, mancozeb, copper, and sulfur, despite being decades to centuries old, are still the backbone of many fruit spray programs. Contact fungicides remain on the surface of plants and prevent infection. However, they are subject to washing off by intense rain (more on that below), and because leaves and shoots grow quickly during spring, contact fungicides need to be reapplied about every 7 days to ensure that new growth is protected. Refer to the 2019-2020 Midwest Fruit Pest Management Guide for details on which fungicides are effective on diseases of various crops.

Locally systemic fungicides, such as the sterol demethylation inhibitors (group 3), QoI/strobilurins (group 11), and SDHI (group 7), start penetrating the cuticle within 20-40 minutes after application and can reach back to inhibit fungal growth 24-72 hours after infection. They are less prone to wash off than contact fungicides, but they are still prone to dilution within rapidly growing tissues.

Contact-only spray programs are unforgiving of rainy conditions. Systemic-only programs are expensive and prone to failure over the long term due to fungicide-resistant pathogens. Spray programs based on combinations of contact and locally systemic fungicides are usually the most effective, especially in rainy springs, and are especially recommended during peak periods of disease susceptibility (e.g., apple pink through petal fall; immediate pre-bloom through 4 weeks post bloom in grape).

How much does rain impact fungicide residues and disease control? A few years ago, Annemiek Schilder's group at Michigan State University addressed this question by spraying potted grapevines with highest label rates of Captec, Ziram, or Abound. A day later, the vines were exposed to simulated rain ranging from 0 to 2 inches. They did not report the duration of the rain events, but more on rain intensity below. Some leaves were tested in a lab to see how much fungicide remained after the rain, while other leaves were inoculated with the fungus *Phomopsis* to see how well the remaining residues would control Phomopsis leaf spot. With just 1/10th inch rain, fungicide residues dropped from 100% to 70%. With 2 inches of rain, residues were just 50% of their original amount. However, despite losing half the fungicide, control of Phomopsis leaf spot remained greater than 95%. Ziram was less tenacious, falling to just 25% of the starting level after 2 inches of rain, but again, there was enough residue to prevent leaf spots. Abound residues dropped to about 60% after 2 inches of rain (perhaps less wash off because it is locally systemic), but leaf spot control remained excellent. From this the researchers concluded that if you start with a high label rate, there will be enough fungicide remaining after 2 inches of rain to control Phomopsis. However, in follow up studies they noted that fresh residues are more tenacious than older residues. They recommended that if residues are fresh (less than 7 days old) at the time of the rain, you should reapply after 2 inches of rain. But if residues are more than 7 days old, then you should reapply after just 1 inch of rain.

The MSU study was only grape, only Phomopsis, and only a few fungicides. However, other work has shown similar trends. For example, just 1/10th inch of rain removed about 50% of captan or copper hydroxide residues from apple or grape leaves, respectively, but there was little loss with further rain. However, if a fungicide has not yet dried on, then much of it is lost with as little as 2 to 4/100th inch of rain. Spraying in a very light rain or misty conditions can help distribute fungicide, but if the rain

gets more intense, then there's a risk of wash off.

In Germany, a study led by M. Hunsche showed that the intensity of rainfall was a greater factor in washing mancozeb from apple seedling leaves than the total amount of rain (see table). They defined light, heavy, and torrential rain as 2/100th, 20/100th, or 1.9 inches per hour. When the total amount of rain delivered was 4/100th inch, only 9% of mancozeb residue was washed off by light rain, but that same amount of torrential rain washed 80% of the mancozeb from the leaves. When the total amount of rain was 20/100th inch, then a light rain removed half the residues, while heavy or torrential rain removed 90%. Other research has shown that under dry conditions, only about 1% of captan residues are lost from apple leaves, presumably from UV or microbial degradation.

Percentage of mancozeb residue removed from apple leaves after rain of various intensities

	Total amount of rain	
Intensity of rain (inches per hour)	**4/100 inch**	**20/100 inch**
Light (2/100th)	9	50
Heavy (20/100th)	55	90
Torrential (1.9)	80	90

What about adjuvants such as spreaders and stickers? Most fungicides are formulated with spreaders/stickers, and when researchers test fungicides for disease control, they usually do so without adjuvants. With some fungicides, too much retention and/or uptake can lead to leaf injury, so be sure to read labels for warnings before using spray adjuvants. Also consider the formulation of fungicide. Dusts are easily washed from leaves and might benefit from a sticker. Micronized sulfur or copper particles are more tenacious than larger particles, and since both can injury leaves and fruit, you should not use stickers with these forms. Wettable powders (WP) and granules (G) are less rain-fast than flowables (F) and suspensions (SC). Emulsifiable concentrates generally are the most rain-fast of formulations

Improved Blossom Thinning strategies for conventional and organic growers

By: Amaya Atucha, UW-Madison Department Horticulture

After the extremely cold winter we had this year plus the frost event we experienced the last weekend of April, I would guess that not many growers are considering the option of bloom thinning. However, in a "normal" year and for organic growers, bloom thinning is a great option to improve annual bearing and increase return bloom, especially now that the pollen tube growth model is available to help time sprays (NEWA pollen tube model).

The main product used for blossom thinning is liquid lime sulfur (LS), which works by inhibiting pollen germination and the growth of the pollen tube, thus preventing the fertilization of flowers. In addition, LS can temporarily inhibit photosynthesis which results in carbohydrate depletion and enhanced thinning effect. LS can be mixed with mineral (dormant and/or summer) or fish oils as an adjuvant to help enhanced its thinning effectiveness.

The first application of blossom thinner is recommended at about 20-30% king bloom and a second one at 80 to 100% bloom. The pollen tube model can make the timing of the applications more precise. The earlier you start the applications, less fruit set and smaller fruit crop, that's why you want to do the first application at 20-30% of open flowers to ensure enough flowers have been fertilized to set the desired crop load. Not more than 2 applications of LS during bloom are recommended.

The recommended LS application rates are 4-12% (v/v) when NOT using oil, and 1.5 to 2% when mixed with oil. Dormant or summer oil at 1% or fish oil at 2% are the oil options suggested. Currently there are 2 LS products registered for use in apples in WI: Brandt® Lime Sulfur and Lime-Sulfur Solution Miller® (link to labels). Good coverage is CRITICAL! However, avoid spraying excessive volume as it can produce leaf and fruit damage. In general, in larger older trees 200 GPA will provide good coverage, while newer high-density orchards with fruiting walls might only need ~50 GPA.

I also want to include a note about the organic biofungicide product Regalia®, which has been used to control scab and fire blight in apple production, as a possible bloom thinner. There has been some research by Dr. Greg Peck, Cornell University, on the use of Regalia® to chemically thin apple flowers in organic orchards. Results of the studies shows that Regalia® has mild bloom thinning effects and could potentially be a useful product when moderate thinning is desired. The product was applied twice during bloom at a rate of 9.4 L of commercial product with a spraying volume of 100 GPA. Here is a link to one of the published studies (Managing apple crop load)(Bloom thinning-Regalia).

Calendar of Events

May 22, 2019 – Berry Spring Field Day
Witte's Vegetable Farm, Cedarburg, WI

July 11, 2019 – Apple Summer Field Day
Bushel & a Peck Market, Chippewa Falls, WI

August 14, 2019 – Cranberry Summer Field Day
Dubey Cranberry, Junction City, WI

August 19-21, 2019 – NACREW conference
Vancouver, BC, Canada

Useful Links:

Wisconsin Fruit Website: https://fruit.wisc.edu/
You can purchase ($10) the 2019 Midwest Fruit Pest Management Guide: https://ag.purdue.edu/hla/hort/documents/id-465.pdf
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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