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UW Extension University of Wisconsin-Extension

Wisconsin Fruit News

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General Information

UW-Madison/Extension Insect Diagnostic Lab update

By: PJ Liesch

With the warmer temperatures, insect activity is starting to pick up in various parts of the state. Growing Degree Day Accumulation is behind normal for the year, meaning that most significant fruit crop insect pests have not yet become active. A summary of early-season fruit-crop insect activity from the UW Insect Diagnostic Lab can be found below:

Grape Flea Beetle: can be a notable pest of grapes. Adult activity was observed in early May in Dane county. More information about grape flea beetle can be found on page 7 of this issue of the newsletter.

Currant Flea Beetle: (aka "sumac flea beetle", *Blepharida rhois*) primarily feeds on sumac, but is known to feed on currants as well. Adults were observed in Dane county in early May.

Brown Marmorated Stink Bug: thus far in 2018, over 10% of all samples received (400+) have been BMSB adults from residential situations. With the building populations of this insect in Wisconsin, growers should be on the lookout for BMSB activity in their orchards. At the moment, the main regions with activity are southern Wisconsin (Dane and Rock County over to SE Wisconsin) and the Fox River Valley (Oshkosh up to Green Bay). More information on brown marmorated stink bug will be provided in the next issue of this newsletter (to be published on May 18).

Fruit-Feeding Caterpillars: spring (especially May and June) is often a period of high pest caterpillar activity. Growers should be on the lookout for species such as tent caterpillars, gypsy moth, and speckled and humped fruitworms in the coming weeks.

Pollinators: pollinator activity (especially wild bees) is increasing with the warmer temperatures, so please pay close attention when spraying.

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 January 1, 2018 through May 4, 2018.

PLANT/ SAMPLE TYPE	DISEASE/ DISORDER	PATHOGEN	COUNTY
FRUIT CROPS			
Apple	*Crown Gall* *Cytospora Canker*	*Agrobacterium tumefaciens* *Cytospora sp.*	*Columbia* *Columbia*

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

Berry Crops

Weed management in established strawberries: can anything be done in spring?

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

A few days ago we pulled back the mulch on our strawberries, and while the strawberry plants still appear to be suffering the effects of the recent spring glaciation period, a few annual grass weeds had already emerged. Can anything be done in spring to get through harvest with a clean field?

Managing weeds in established, bearing strawberries focuses largely on renovation time and fall dormancy. In the spring, of course leaving a thick straw mulch between strawberry rows physically suppresses many weeds, but also limits any potential for cultivation that could also damage the upcoming crop.

When it comes to herbicide use in spring, several factors come into play:

1) Crop safety: several herbicides need to be applied to dormant strawberry plants to limit potential injury.

2) Weed growth stage: some herbicides only control weeds prior to emergence, some after emergence and a few do both. For herbicides that provide post-emergent control, weed growth stage can be a limitation - in general, they're much more effective on younger, smaller weeds.

3) Pre-harvest interval: this is the time period required from herbicide application to crop harvest to ensure that any remaining pesticide residue doesn't exceed established food tolerance levels. It's absolutely critical to your customer's safety and your business.

A combination of these factors, and most often the pre-harvest interval, limit spring herbicide use in strawberry. The table below provides some examples of pre-harvest intervals, but **keep in mind that there may also be other limitations, such as application to *only* dormant strawberry plants and weed growth stages.** *Pesticide labels change often - always read and follow the label!*

Example trade name	Pre-harvest interval
Sinbar	110 days
Prowl H_2O	35 days
Spartan 4F	70 days
Poast	7 days
Select Max	4 days

In our case, we're fortunate that the weed management work that was done last year at renovation and fall dormancy before mulching has paid great dividends, and now we just need to take care of a few grasses with a post-emergent grass herbicide.

In the meantime, we'll look forward to warming sunshine and the sweet taste of that first berry of the season!

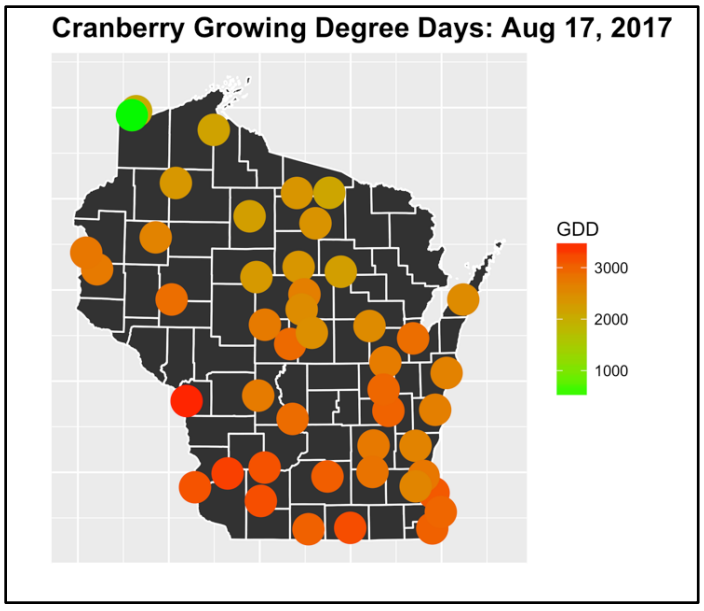
Cranberries

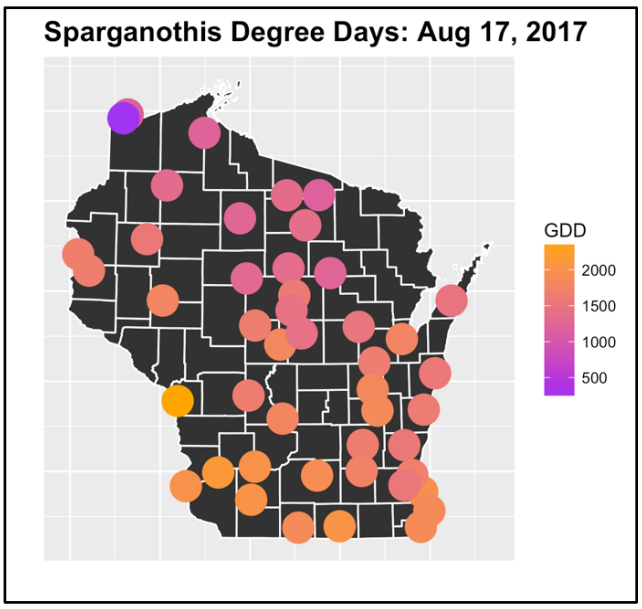
Cranberry plant and pest degree-days: May 1, 2018

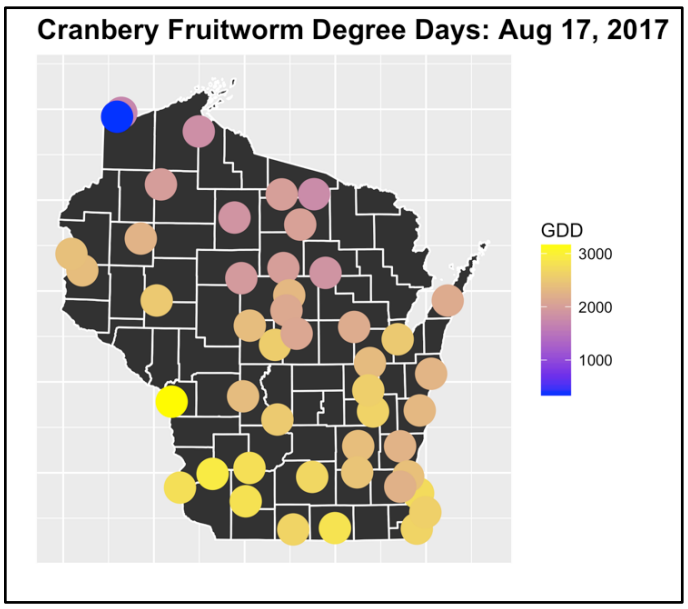
By: Elissa Chasen and Shawn Steffan, USDA-ARS and UW Entomology

Happy spring! What a long winter that was; it feels good to be on the other side of it. I hope everyone is enjoying the warmer weather.

See the maps below for the degree-days of the cranberry plant and associated pests. You may 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. Interactive maps are posted online. The interactive feature allows you to click on the map locations, prompting a pop-up that names the location and gives exact degree-days. These are available through the Steffan lab website (http://labs.russell.wisc.edu/steffan/cranberry-growing- degree-days/). Once on the website, follow the link to the interactive maps.







With the longer and cooler early part of spring, we are a bit behind our typical degree-day accumulations. You can see that in the table below that compares degree-days over the last three years.

May 1	Cranberry DDs			Sparg DDs			CFW DDs		
	2016	**2017**	**2018**	**2016**	**2017**	**2018**	**2016**	**2017**	**2018**
Northern WI (Minocqua)	230.4	189.9	101.5	85.3	64.2	44.4	169.3	137.2	77.9
Central WI (Wisconsin Rapids)	337.7	315.2	137.9	137.7	131.6	58.3	253.8	240.8	103.7

Grapes

Crop load for cold climate hybrid grapevines: how can we assess if our vines are balanced?

By: Amaya Atucha, UW Extension Fruit Crop Specialist

Crop load refers to the ratio of fruit to vegetative growth (leaves and shoots) a vine produces during a growing season. Understanding crop load ratios allows the grower to determine the optimal amount of fruit that a given vine can ripen, without losing fruit quality, and ensuring a consistent and sustainable production year after year. The target crop load will depend of several factors: the amount of light a vine can intercept (more light interception the greater the crop a vine can ripe), training systems (divided canopy will be able to ripe more fruit), how many buds are left after pruning, and the age of the vines (mature vines are able to ripe larger crops).

Crop load can be expressed as the pounds of fruit/pounds of dormant pruning. A common name for the ratio of fruit yield per vine to subsequent dormant pruning weight per vine is the Ravaz index. For example, if a vine produced 10 lbs of fruit during 2017, and the dormant pruning weights during winter 2018 was about 2 lbs, then the Ravaz index score for that particular vine is 5. For vinifera cultivars (i.e., 'Cabernet Sauvignon', 'Chardonnay', 'Pinot Noir') Ravaz index scores between 5 to 8 are recommended, assuming the shoots are well exposed to sunlight. However, for cold climate hybrids (i.e., Marquette, Frontenac, La Crescent) there are no recommended scores defined yet. Data recorded from West

Madison Agricultural Research Station during the last decade, have shown that cultivars like 'Marquette' have an optimal score of between 5 and 7, while 'Frontenac' has the capacity to ripen more fruit with scores of between 7 and 11. Cultivars like 'Brianna' have optimal scores of between 4 and 6.

$$\text{Ravaz Index} = \frac{\text{Lb of fruit}}{\text{Lb of dormant pruning weight}} =$$

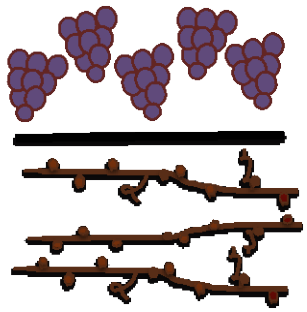


Image credit: Madeline Wimmer

There are several practices that can be used to adjust crop load in vines. The most common practice is to adjust the number of buds that are left per vine during dormant pruning. This can be achieved using a pruning formula that will determine the number of buds retained after pruning based on the weight of the canes. One of the most used formulas is the 30+10, meaning 30 buds are left per vine for the first pound of pruning weights and another 10 buds for each additional pound of pruning weights. For example, if 3 pounds of canes are pruned of a vine, these means that 30 buds will be left for the first pound of canes, plus 10 buds for the second pound, and 10 more buds for the third pound, for a total of 50 buds per vine. The 30+10 formula was developed for native grapes, such as Concord and Niagara in NY state, that are not fruitful in the first node positions, as hybrids are. A more adequate formula for cold climate hybrids might be 20+20 or 20+10. These balance pruning formulas are just guidelines to help growers adjust crop load, however each grower should adjust it depending of the performance of their vineyard.

More information on crop load ratios, vine balance, and pruning formula:

- How to prune vines- Cornell University
- Untangling the concepts of vine size, capacity, crop level, vigor, and vine balance
- Basic Concept of Vine Balance

Grape Variety Developmental Stages: May 3, 2018

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

After this past week of warm temperatures, buds have started to move quickly at the West Madison Agricultural Research Station (WMARS). However, buds are still a bit behind compared to 2017 – last year many cultivars were already at E-L 3 ("woolly bud") by the end of April, whereas this year most varieties are still at E-L 2 ("bud scales opening"), with only Foch at E-L number 3. At the Peninsular Agricultural Research Station (PARS), all varieties are still at E-L number 1 ("winter bud").

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

As buds are beginning to swell, grape flea beetles may be feeding on the developing buds (see following article for more information about flea beetles).

Following photos taken on May 3rd at West Madison Agricultural Research Station.

Brianna at WMARS;
"bud scales opening"
E-L number = 2

La Crescent at WMARS;
"bud scales opening"
E-L number = 2

La Crosse at WMARS;
"bud scales opening"
E-L number = 2

Itasca at WMARS;
"bud scales opening"
E-L number = 2

Marquette at WMARS;
"bud scales opening"
E-L number = 2

Frontenac at WMARS;
"bud scales opening"
E-L number = 2

Foch at WMARS;
"woolly bud"
E-L number = 3

Petite Pearl at WMARS;
"winter bud"
E-L number = 1

Grape Growing Degree Days (Base 50, BE)

April 1 - May 2

	2018	2107	2016
WMARS	54	82	
PARS	41	52	43

The growing degree-day accumulations as of May 2nd for this year are: 122 GDD at WMARS and 147 GDD at PARS. Despite the warm weather of the past week, these are slightly lower than in previous years. However, plant development and degree day accumulation seems to be rapidly catching up with previous years' averages.

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).

Grape insect scouting report: flea beetles out in full force

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

Buds are swelling in the vineyard and that means grape flea beetle is out feeding. At the West Madison Agricutlural Research Station (WMARS) on May 3rd,there was an average of 2 flea beetles per 3 vines, with up to four flea beetles found on a single vine. Additionally, many vines showed bud damage. The following article was first published in season 2, issue 2 of this newsletter, in 2017. Please visit the original article for more information comparing grape flea beetle with cutworm damage in the vineyard.

As buds are swelling in the southern regions of the state, and soon will be in the northern growing regions, it's time to begin scouting for flea beetle and cutworm damage. These two insects are similar in that they are rarely seen themselves, but most often are known to be in the vineyard from the damage symptoms evident on the buds. Damage symptoms look similar, as both burrow into and hollow out developing buds around bud swell until bud break. However, it is important to determine which is causing damage, as control measures differ depending on which pest is present in your vineyard. The following article outlines how to determine if you have a problem with either of these insects, which is causing the damage, and how to manage them.

Grape flea beetle adult.

Damage symptoms

Grape bud with a hole from flea beetle feeding. This was diagnosed as flea beetle damage, rather than cutworm, due to adult flea beetles found nearby.

Flea Beetle adults feed on swelling grape buds during the day in the spring, and then the larvae and summer-generation adults feed on grape leaves during the summer. However, the spring generation feeding on the buds is the only to cause economically-significant damage. These adults can sometimes be found sunning themselves on the vines and buds, and are easy to spot and distinguish since they are an iridescent-black/blue.

Flea beetle damage symptoms look the same as the damage caused by cutworms, which also feed on grape buds in the spring. To determine if cutworms are the culprit causing your bud damage, go into the vineyard at night with a flashlight, into an area with a lot of damage, and look for the thick brown caterpillars feeding on the buds.

Control measures

Flea beetle cultural control can include the removal of brushy overwintering sites on the edges of the vineyards. Additionally, discing the aisles in June or July, during pupation, can damage or desiccate the delicate pupae. However, early season damage to 2-5% of buds warrants an insecticide application, especially during a cool spring growing season such as we saw last spring, when buds remained at bud swell for a prolonged period of time.

The following table contains information on some of the insecticide options available for use on flea beetle on grapes in Wisconsin. We do not recommend these chemistries above other options, and all product recommendations can be found in the 2017 Midwest Fruit Pest Management Guide. As always, it is necessary to read and follow the label.

Class (IRAC code)	Tradename	Active ingredient	PHI (days)	Effectiveness
Pyrethroids (3A)	Baythroid XL	Beta-cyfluthrin	3	Excellent
	Danitol	Fenpropathrin	21	Excellent
Neonicotinoids (4A)	Scorpion (foliar)	Dinotefuran	1	
	Scorpion (soil)	Dinotefuran	28	
Carbamates (1A)	Sevin XLR Plus	Carbaryl	7	Excellent

Tree Fruits

First steps in the precision apple thinning process

By: Janet van Zoeren and Amaya Atucha

Pre-bloom preparation

Before bloom, there are some tasks to be done to prepare for using a precision thinning protocol this spring.

1. **Check that your weather station is working correctly by reviewing the weather data in the NEWA website.** We have encountered some problems when testing models for different weather stations across the state. Checking the data and model outputs early, so that if there is an error or malfunction we can address immediately.

2. **If you have trouble with you weather station,** you can submit a help request at: https://newa.zendesk.com/hc/en-us, or contact the state coordinator Amaya Atucha (atucha@wisc.edu)

3. **Record the dates for green tip and full bloom in each block you hope to run a precision thinning model**, as these are important inputs to help make the model as accurate as possible.

Background on precision apple thinning

Thinning is a critical and risky task in apple production. Over thinning will result in reduced yield and poor quality

fruit, while under thinning will result in small fruit and low return bloom. However, the optimal timing and concentration of chemical thinner will varies depending on many factors, including pollinator efficacy, apple variety and rootstock, but most importantly weather condition during bloom and fruit-set.

Researchers at Cornell University, University of Massachusetts, and Michigan State University have developed a precision thinning protocol, which incorporates weather data and forecasts, cluster counts and fruit growth measurements, to determine timing and concentration of chemical thinner to apply, as well as the efficacy of the applications (for more information see the links below). This growing season, Wisconsin growers will have access to NEWA for the first time, and so this summer we will go through the process of using the precision thinning protocol and we will provide recommendations, as well as information on how to implement the protocol, in our biweekly newsletter articles. This article will explain the theory and utility of the carbohydrate and fruitlet growth models, which we will be using to make precision thinning decisions. Future articles will look at the decisions we make throughout the process, including number of trees to measure per block, how to use the NEWA weather data and website, how to measure fruitlets, and thinning decisions made.

For more information about a grower's perspective on using the NEWA stations and making precision management decisions, please see our article "Grower interview with Allen Teach of Sunrise Orchards: experience with precision thinning tools" on page 12 of this issue of the newsletter.

The carbohydrate model

The carbohydrate model, which was developed by Dr. Alan Lakso at Cornell University, factors in the environmental conditions (i.e. temperature, solar radiation, and day length) measured by weather stations, to estimate the tree carbohydrate production from bud break over the growing season. The model estimates how much carbohydrates are produced by the tree, as well as the consumption of carbohydrates to support growth during this period, and calculates a daily balance of carbohydrate using the weather data recorded through the NEWA weather stations. The carbohydrate balance strongly correlates with the sensitivity of the tree to chemical thinner and natural fruit drop. What this means is that during cool and sunny days, when trees are able to produce a good supply of carbohydrates, trees will be less responsive to chemical thinner. On the contrary, cloudy and warm periods, will results in a deficit in carbohydrate and trees will respond strongly to the chemical thinner. The carbohydrate model on the NEWA website (http://newa.cornell.edu/index.php?page=apple-thin) uses the four-day running average to calculate the carbohydrate balance, as trees do not just respond to one warm or cool day. The thinning recommendation provided by the model takes into account the weather forecast over the next four days from the date you consider spraying, and will provide recommendation of whether to increase or decrease the concentration of a thinner application if you were to spray that particular day.

The main input from the grower is the date on which trees in your orchard reaches **green tip and full bloom**, which informs the model of when trees will begin to photosynthesize and assimilate carbohydrates. Then the model relies on temperature and solar radiation data (from the weather station) to calculate the expected carbohydrate balance of the trees in the orchard. During the following weeks we will ran the model for a selected number of stations, and will provide interpretations to the results to help growers make an inform decision of when and how much to spray.

The fruitlet growth model

The fruitlet growth model, developed by Dr. Greene at the University of Massachusetts, is a way to determine how effective a thinner application was by estimating the number of fruitlets that will drop within eight days after the thinner application. The fruitlet growth model is based on the measurement of fruit growth, and the fact that fruitlets that will drop will have a growth rate about half or less than the fruitlet that will persist to harvest. This allows for multiple thinner applications with frequent and accurate check-ins of the actual crop-load still on the tree. Using this information, Dr. Greene developed a model to determine which fruitlets will abscise, and Dr. Philip Schwallier at Michigan State programed a downloadable excel spreadsheet for easy computation of fruit set (you can download the excel spreadsheet at: https://fruit.wisc.edu/apples-and-pears/#pruning). Using the spreadsheet, you first determine your target crop load, then measure the diameter of developing fruitlets beginning at 6mm and continuing at 4 and 8 days after each thinner application.

The spreadsheet will let you know when you've reached your target crop load.

We will be expanding on this entire process in a series of articles beginning in the next newsletter, where we will discuss choosing blocks, trees, and clusters to measure, and how to conduct initial fruitlet diameter measurements. We hope you find this series interesting!

Current carbohydrate model outputs

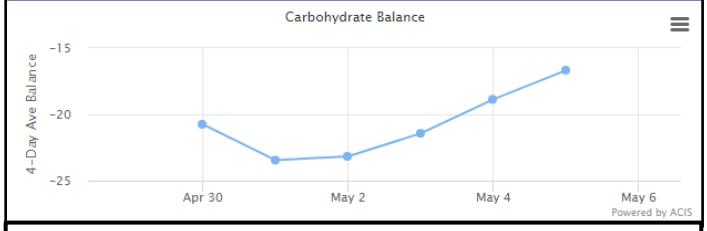
All the orchards we spoke with have reached green tip on most varieties over the course of the past week, and none have yet reached full bloom. Because we are not yet at full bloom, the apple carbohydrate model doesn't currently offer a thinning recommendation. However, if you enter your green tip date on the NEWA carbohydrate model webpage, you can see the following outputs, with information on tree carbohydrate status. The green bar shows the current day's temperature and solar radiation data, and the model's estimate of tree's carbohydrate balance. Below the green bar, in tan, is the forecasted weather data and corresponding forecasted carbohydrate balance. Following full bloom, this information will be taken together to provide a recommendation of whether to increase or decrease the strength of your thinner application.

Richland County

Current phonological stage: ½-inch green
Green tip: 4/30
Full bloom: not yet happened

Apple Carbohydrate Thinning Model Results

Date	Max Temp (°F)	Min Temp (°F)	Solar Rad (MJ/m2)	Tree Carbohydrate Status (g/day)				Thinning Recommendation
				Production	Demand	Balance	4-Day Ave Balance	
4/30	82	41	23.1	0.00	13.56	-13.56	-20.75	-
5/1	77	61	19.0	0.00	20.89	-20.89	-23.45	-
5/2	76	60	13.8	0.00	24.45	-24.45	-23.17	-
5/3	72	54	9.4	0.00	24.11	-24.11	-21.43	-
5/4	75	50	22.0	0.80	25.16	-24.37	-18.87	-
5/5	74	44	22.4	2.51	22.25	-19.74	-16.68	-
5/6	67	46	18.3	2.81	20.32	-17.51		-
5/7	69	41	23.2	5.40	19.28	-13.88		-
5/8	72	42	23.3	6.18	21.77	-15.59		-



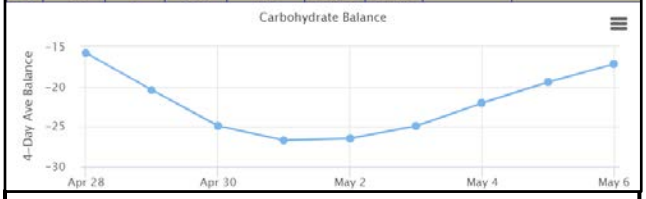
Green tip occurred on 4/30, and full bloom has not yet occurred. Because full bloom has not occurred, there is no thinning recommendation output at this time.

Trempealeau County

Current phonological stage: tight cluster
Green tip: 4/28
Full bloom: not yet happened

Apple Carbohydrate Thinning Model Results

Date	Max Temp (°F)	Min Temp (°F)	Solar Rad (MJ/m2)	Tree Carbohydrate Status (g/day)				Thinning Recommendation
				Production	Demand	Balance	4-Day Ave Balance	
4/28	59	34	23.1	0.00	6.54	-6.54	-15.81	-
4/29	67	34	23.2	0.00	8.72	-8.72	-20.44	-
4/30	82	54	23.0	0.00	20.30	-20.30	-24.91	-
5/1	79	64	18.8	0.00	27.68	-27.68	-26.69	-
5/2	68	59	15.1	0.00	25.04	-25.04	-26.46	-
5/3	73	54	19.0	0.17	26.80	-26.63	-24.92	-
5/4	78	52	22.9	1.58	29.02	-27.43	-22.05	-
5/5	79	50	21.0	2.46	29.19	-26.73	-19.43	-
5/6	69	49	21.9	5.00	23.91	-18.91	-17.18	-
5/7	72	44	23.1	7.04	22.16	-15.12		-
5/8	74	48	22.7	7.48	24.43	-16.95		-
5/9	71	49	14.0	4.43	22.19	-17.75		-



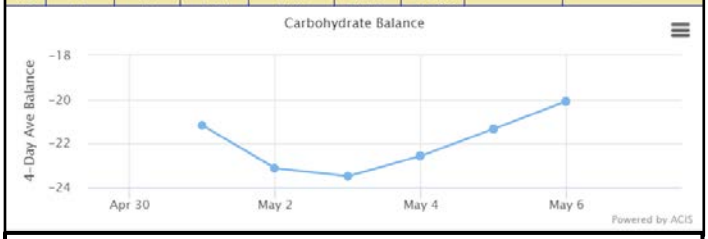
Green tip occurred on 4/28, and full bloom has not yet occurred. Because full bloom has not occurred, there is no thinning recommendation output at this time.

La Crosse County

Current phonological stage: ½-inch green
Green tip: 5/1
Full bloom: not yet happened

Apple Carbohydrate Thinning Model Results

Date	Max Temp (°F)	Min Temp (°F)	Solar Rad (MJ/m2)	Tree Carbohydrate Status (g/day)				Thinning Recommendation
				Production	Demand	Balance	4-Day Ave Balance	
5/1	79	64	18.8	0.00	18.96	-18.96	-21.18	-
5/2	68	59	15.1	0.00	18.38	-18.38	-23.12	-
5/3	73	54	19.0	0.00	21.44	-21.44	-23.48	-
5/4	78	52	22.9	0.00	25.96	-25.96	-22.56	-
5/5	79	50	21.0	0.44	27.14	-26.69	-21.34	-
5/6	69	49	21.9	2.44	22.25	-19.82	-20.09	-
5/7	72	44	23.1	4.04	21.81	-17.76		-
5/8	74	48	22.7	4.37	25.47	-21.10		-
5/9	71	49	14.0	2.43	24.12	-21.69		-



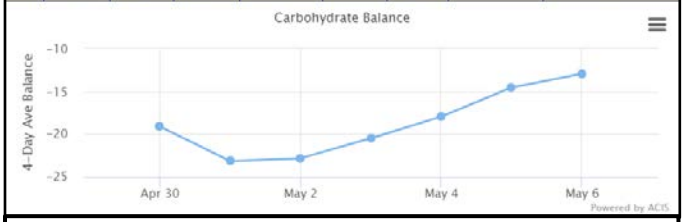
Green tip occurred on 5/1, and full bloom has not yet occurred. Because full bloom has not occurred, there is no thinning recommendation output at this time.

Racine County

Current phonological stage: tight cluster
Green tip: 4/30
Full bloom: not yet happened

Apple Carbohydrate Thinning Model Results

Date	Max Temp (°F)	Min Temp (°F)	Solar Rad (MJ/m2)	Tree Carbohydrate Status (g/day)				Thinning Recommendation
				Production	Demand	Balance	4-Day Ave Balance	
4/30	79	29	24.5	0.00	9.96	-9.96	-19.12	-
5/1	82	57	17.1	0.00	20.21	-20.21	-23.17	-
5/2	83	60	15.3	0.00	26.42	-26.42	-22.83	-
5/3	69	49	7.0	0.00	19.90	-19.90	-20.48	-
5/4	73	54	6.9	0.00	26.15	-26.15	-17.94	-
5/5	69	47	23.3	2.41	21.28	-18.87	-14.52	-
5/6	66	45	16.9	2.35	19.33	-16.98	-12.93	-
5/7	62	40	23.7	5.46	15.22	-9.75		-
5/8	68	40	24.1	6.20	18.70	-12.50		-
5/9	67	42	23.7	7.03	19.53	-12.49		-



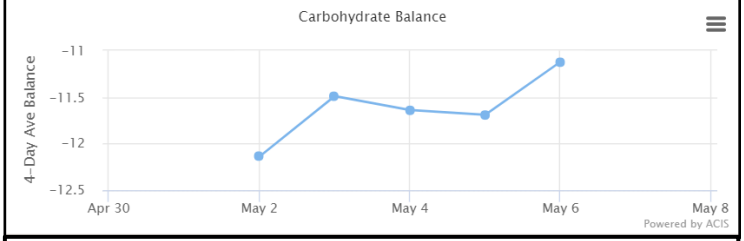
Green tip occurred on 4/30, and full bloom has not yet occurred. Because full bloom has not occurred, there is no thinning recommendation output at this time.

Door County

Current phonological stage: green tip
Green tip: 5/2
Full bloom: not yet happened

Apple Carbohydrate Thinning Model Results

Date	Max Temp (°F)	Min Temp (°F)	Solar Rad (MJ/m2)	Tree Carbohydrate Status (g/day)				Thinning Recommendation
				Production	Demand	Balance	4-Day Ave Balance	
5/2	70	46	16.9	0.00	11.79	-11.79	-12.14	-
5/3	58	42	19.0	0.00	8.99	-8.99	-11.49	-
5/4	68	44	20.3	0.00	13.64	-13.64	-11.64	-
5/5	65	44	22.3	0.00	14.14	-14.14	-11.69	-
5/6	55	39	22.7	0.73	9.91	-9.18	-11.12	-
5/7	59	36	23.4	1.19	10.81	-9.62		-
5/8	62	42	23.2	1.29	15.13	-13.84		-
5/9	57	41	18.2	1.56	13.41	-11.85		-



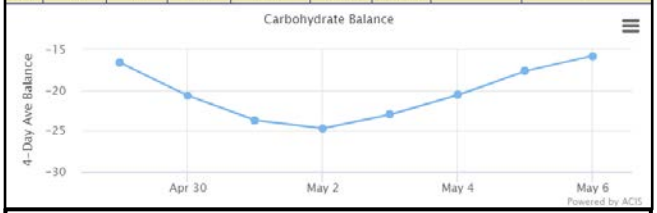
Green tip occurred on 5/2, and full bloom has not yet occurred. Because full bloom has not occurred, there is no thinning recommendation output at this time.

Dane County

Current phonological stage: tight cluster
Green tip: 4/29
Full bloom: not yet happened

Apple Carbohydrate Thinning Model Results

Date	Max Temp (°F)	Min Temp (°F)	Solar Rad (MJ/m2)	Tree Carbohydrate Status (g/day)				Thinning Recommendation
				Production	Demand	Balance	4-Day Ave Balance	
4/29	63	30	23.1	0.00	6.52	-6.52	-16.69	-
4/30	80	45	21.6	0.00	15.32	-15.32	-20.68	-
5/1	77	56	12.5	0.00	20.78	-20.78	-23.68	-
5/2	74	58	10.1	0.00	24.12	-24.12	-24.66	-
5/3	63	58	6.1	0.00	22.50	-22.50	-22.98	-
5/4	76	53	21.3	0.47	27.81	-27.34	-20.6	-
5/5	78	48	23.3	2.27	26.94	-24.67	-17.67	-
5/6	64	49	19.3	3.41	20.81	-17.40	-15.83	-
5/7	68	41	23.6	6.21	19.22	-13.01		-
5/8	71	44	23.7	6.78	22.40	-15.62		-
5/9	69	46	15.1	4.47	21.75	-17.29		-



Green tip occurred on 4/29, and full bloom has not yet occurred. Because full bloom has not occurred, there is no thinning recommendation output at this time.

Relevant Literature:

Anon. 2010. Effective fruit thinning: How to know if you've thinned enough. Good Fruit Grower.

Greene, D.W. et al. 2013. Development of a Fruitlet Growth Model to Predict Thinner Response on Apples. HortScience 48: 584-587.

Lehnert, R. 2015. Videos teach precision crop load management. Good Fruit Grower.

Schwallier, P. and A. Irish-Brown. 2015. Predicting Apple Fruit Set Model. New York Fruit Quarterly 23: 15-18.

Grower interview with Allen Teach of Sunrise Orchards: experience with precision thinning tools

By: Janet van Zoeren and Amaya Atucha – UW-Madison

Wisconsin growers have a new resource this year – NEWA (the Network for Environment and Weather Applications), which can help guide management decisions. Allen Teach of Sunrise Orchards is no newcomer to this system, since he has had his weather station connected to NEWA for the past three growing seasons, and prior to that, he used a variety of other tools to help guide precision management decisions. He was willing to share with us his experiences with NEWA and with precision management tools.

Allen Teach of Sunrise Orchards stands by his weather station, which has been connected to NEWA for over three years.

Allen said that he has always been interested in precision management decisions, and that as early as in 1980 he was using an electronic leaf wetness sensor. However, after a workshop in Geneva, New York, he decided to ask the NEWA board to allow him to connect his weather station to their network. Sunrise become the first out-of-NY state orchard to join the network, several years before Wisconsin would join (for more information on the NEWA, contact state coordinator Amaya Atucha at atucha@wisc.edu).

What does Allen use his weather station for?

- He specifically got it for the apple carbohydrate thinning model.
- Irrigation: all of his trees are currently under drip irrigation system. He enters the tree spacing and # of emitters, and the model provides recommendation on the frequency and amount of water to apply through the irrigation system to replenish soil moisture to field capacity.
- Leaf wetness model for scab: Allen prefers avoiding post-infection sprays, so he relies on the leaf wetness sensors and the apple scab predicting model to protect his crop with timely sprays. The leaf wetness sensors also provide information to run multiple other models and help time spray schedules for a variety of summer diseases.
- Codling moth: the codling moth model gives information on the most effective times to control this insect pest.
- Plum curculio: the plum curculio life cycle model helps Allen determine when their flight is over, and to best time their control.

During the summer, Allen said that he runs these models just about every day.

Putting into use the NEWA apple carbohydrate model

The carbohydrate model is a tool that uses weather variables (such as temperature and solar radiation) to determine if the tree has surplus or a shortage of carbohydrate, and how that will affect the effectiveness of thinning sprays. To read more about the model, please read our article "First steps in the precision apple thinning process" on page 8 of this issue of the newsletter. Additionally, many of these steps will be the subject of future newsletter articles this spring, as I will be using the carbohydrate model as well as the fruitlet growth model to help growers implement the precision thinning protocols this spring, and then will be publishing this process in each issue for the next few weeks.

Crop load- Allen uses a gauge to measure branch diameter, then determines a target crop load based on the size of the trees (Cornell University Young Apple thinning gauge or Equilifruit disc). He mentioned that is one of the most important aspects of the thinning model, although it can be difficult to emphasize as much as it should be since this is the same time in the spring when apple growers are planting new trees.

 # blocks- Allen makes measurements on three blocks of Honeycrisp and one of Gala, and extrapolates from these blocks to decide for rest of orchard. Sometimes he will make measurements on a block of McIntosh as well.

When to thin- Allen does not do any bloom thinning. In Cortland he does not thin at all. McIntosh he first thins at around 6-8 mm size. Honeycrisp he thins as soon as the bees are gone, and may do 1, 2 or 3 passes, with rate adjusted based on model. He still hand thins in June and July, and feels it is better to under-thin by 5% and then hand thin the rest, instead of risking over-thinning.

Allen mentioned that, along with using the information from the model to guide his thinning decision, he also relies in his years of experience as an apple grower to make the final decisions. Additionally, he finds that the model is doubly useful because it also impresses on his brain and helps to teach him about the most important factors that affect thinning, and what to focus on himself when making these decisions.

Any maintenance issues with the weather station?

- The main maintenance work associated with the weather station is keeping the rain-bucket clean.
- Overall, the most important thing is to keep the weather station in line of sight to the modem.
- After three years, Allen replaced the battery on his weather station. He knew he needed to do that because of the NEWA blog, which sends out periodic emails with information about the system. Allen just bought a new battery on Amazon.
- He did have to get a new weather station after the original one he purchased got struck by lightning (!). The old one was refurbished, so now he has a backup.
- Otherwise, there have been no maintenance issues at all.

Over all, Allen said that he definitely finds it worth the investment on the weather station for all the information you can get. We are looking forward to hearing from more of you about your experiences with the weather stations and with NEWA in coming years. A big thank you to Allen Teach for sharing his experiences and knowledge with us!

Calendar of Events

May 31, 2018 – Berry Summer Field Day
8 am – 5 pm, N9895 Kluth Rd, Clintonville, WI

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