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Wisconsin Fruit News

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In This Issue:

General Information:

NEWA weather stations page 1

Insect Diagnostic Lab Update page 2

Berry Crops:

Spring insects page 2

Cranberries:

Degree day insecticide trials page 2

Grapes:

Grape flea beetle page 5

Tree Fruits:

Promoting branching page 6

Prebloom fertility page 8

Dog wood borer mating Disruption page 9

Calendar of Events: page 10

Welcome back! We're excited to get started on the fourth season of the Wisconsin Fruit News.

A special thanks to Janet van Zoeren who took care of putting this newsletter together for the last three years! Janet is now with Cornell University and we wish her all the best!

General Information

NEWA weather station maintenance- Now is the time!

By: Amaya Atucha, UW-Madison Department Horticulture

To collect accurate weather data, you need to take care of your weather station. Here's a checklist to make sure you are getting the best possible data feed from your weather stations.

1) It is important to check the weather station every 2-3 weeks during the growing season. For this, pick the dates and add them to your calendar/planner at the beginning of the season.
2) Clean the solar radiation sensor. The diffuser can be cleaned with a damp cloth. You will need to replace the sensor if it has turned yellow.
3) Check the anemometer (wind speed device) and weather vane (wind direction). Make sure the anemometer (spinning fan) and weather vane move freely in all directions. Set the weather vane to zero on due North.
4) Check the leaf wetness sensor. Examine the plastic board and electrodes for corrosion, cracking or weathering damage.
5) Check the relative humidity sensor. Verify the accuracy of RH measurements by looking at NEWA values on mornings that are rainy or have heavy dew.
6) Clean the rain gauge. Remove leaves, nests, insect, spider webs and other debris. Here's a link to a YouTube video to learn more about tipping bucket maintenance (https://www.youtube.com/watch?v=_7Q3xL2vvPg&feature=youtu.be)

To get in touch with Rainwise support for station servicing or replacement of your weather station sensor assembly please reach out to the RainWise Inc. Service Department for consultation by phone (207) 801-4039 or email service@rainwise.com.
Contact support@newa.zendesk.com with other questions regarding the online NEWA platform at newa.cornell.edu.

Update from the UW Insect Diagnostic Lab

By: PJ Liesch, UW Madison Extension Entomologist

With the limited number of growing degree days accumulated thus far, the caseload at the UW Insect Diagnostic Lab has been low through the first quarter of 2019. Insect reports are expected to increase in the coming weeks as buds begin to break, and fruit crops start to green up around the state.

Brown marmorated stink bug: The only fruit pest with notable activity thus far has been the invasive brown marmorated stink bug. The Insect Diagnostic Lab has received a steady flow of reports this past winter of overwintering BMSB adults found inside of structures; thus far in 2019, the lab has received over 30 BMSB reports. The majority of these reports have come from **southcentral Wisconsin** (esp. Dane and Rock counties), **southeastern** Wisconsin (esp. Milwaukee and Waukesha counties), and the **Hwy 41 Corridor** from Oshkosh north to Green Bay. In southern Wisconsin, Dodge county recently had a confirmed BMSB report, placing it amongst the 28 other counties with confirmed BMSB sightings. Due to their habit of overwintering in sheltered locations, this winter's polar vortex is not expected to have had much of an impact on their populations. Fruit growers around the state should be on alert for BMSB this year.

Berry Crops

Spring is here and insects will soon follow!

By: Christelle Guédot, UW-Madison

As the title say, Spring is here, and we are looking forward to eating delicious Wisconsin berries this year yet again! It is time to gear up for scouting insects that show up first in strawberry, including tarnished plant bug, mites, and root weevils. The most problematic insect in Wisconsin berries is tarnished plant bug. While it is not a specialist on strawberry, it can be a season-long pest in strawberry with both adults and immatures feeding on fruit and causing damage. For more information about tarnished plant bug biology and management, please refer to this previous article. Other insects you can read about and should be aware of at this time of the season include strawberry root weevil, black vine weevil, two spotted spider mites, and cyclamen mites. Also please refer to the BioIPM strawberry workbook for more information on insects, diseases, weeds and overall strawberry information. It is available on the UW learning store for download for free or for purchase at the link provided.

Happy growing season!

Cranberries

Degree-day based insecticide trials

By: E. Chasen, C. Guédot, J. Perry, S. Steffan

Well-timed insecticide applications can save growers hundreds of dollars per acre, due to both improved crop protection and reduction in input costs. The ideal timing can be achieved using a combination of population monitoring and degree-day models. Degree-day (DD) models correlate heat-unit accrual with insect life-stage

benchmarks. Being able to reliably predict the emergence of a key life-stage increases insecticide application efficacy.

Examples of this principle have been demonstrated through research in various agricultural settings. In peach production, insecticides were applied at 100 DD intervals after the first moth was caught in monitoring traps. Incidence of fruit damage was lowest when insecticides were applied at 600 DDs. If they were applied 100 DDs earlier, damage incidence increased two-fold. If they were applied 100 DDs later, damage incidence increased three-fold [1]! During the growing season, 100 DDs can accumulate in as few as three days (a hot summer day can produce 30+ DDs). Another study, conducted in apple production, showed that insecticide applications timed in three-day-increments led to a significant difference in fruit damage. Applications made three days earlier than ideal resulted in 1.4% greater fruit damage, and applications made three days later than ideal led to 2.0% greater damage [2]. In high-value crops, such as cranberry, even small differences in damage can amount to a significant loss in take-home profits.

Previous research conducted in the USDA Cranberry Entomology lab has established that the upper and lower developmental thresholds for sparganothis fruitworm (*Sparganothis sulfureana*) are 86 and 50°F respectively [3]. Additional research has correlated DD accrual with sparganothis fruitworm development and phenology, so that we can predict when moths will begin to lay eggs and when larvae will begin to develop [4]. We tested the idea that insect damage varied as a result of insecticide applications timed for different sparganothis fruitworm phenological benchmarks in cranberry production.

METHODS

Sites: Our trial was replicated five times at each of two commercial cranberry production marshes in Central WI on 6' x 8' plots. Degree-days were calculated for each of the sites. Altacor was applied based on pre-determined DD benchmarks (table 1), using a backpack sprayer at 4.5 ounces/acre.

Treatments:

DD benchmark	**DDs for each benchmark**
25% of sparganothis egg-hatch	1,140 sparganothis DDs
75% of sparganothis egg-hatch	1,640 sparganothis DDs
25% & 75% of sparganothis egg-hatch	1,140 & 1,640 sparganothis DDs

Table 1. Degree-day benchmarks for insecticide applications and corresponding degree-day accruals.

Insect damage assessment: When all insecticide applications were completed, damaged berries were collected from each plot over three consecutive weeks. Damaged berries from each plot were summed together for final analysis.

RESULTS

Due to geographical and microclimate differences, the actual date of treatments varied between the two sites (table 2).

Marsh	Treatment	DDs at application	Calendar Date
1	25% of sparganothis egg-hatch	1,120	6/29
1	75% of sparganothis egg-hatch	1,604	7/18
2	25% of sparganothis egg-hatch	1,113	7/3
2	75% of sparganothis egg-hatch	1,643	7/30

Table 2. Insecticide application treatments at each marsh with corresponding degree-day accruals and calendar date of application.

Damaged berries: The effect of insecticide application timing at either marsh was not the same. There is a difference in damaged berries by treatment timing at marsh 1 but not at marsh 2 (fig. 1).

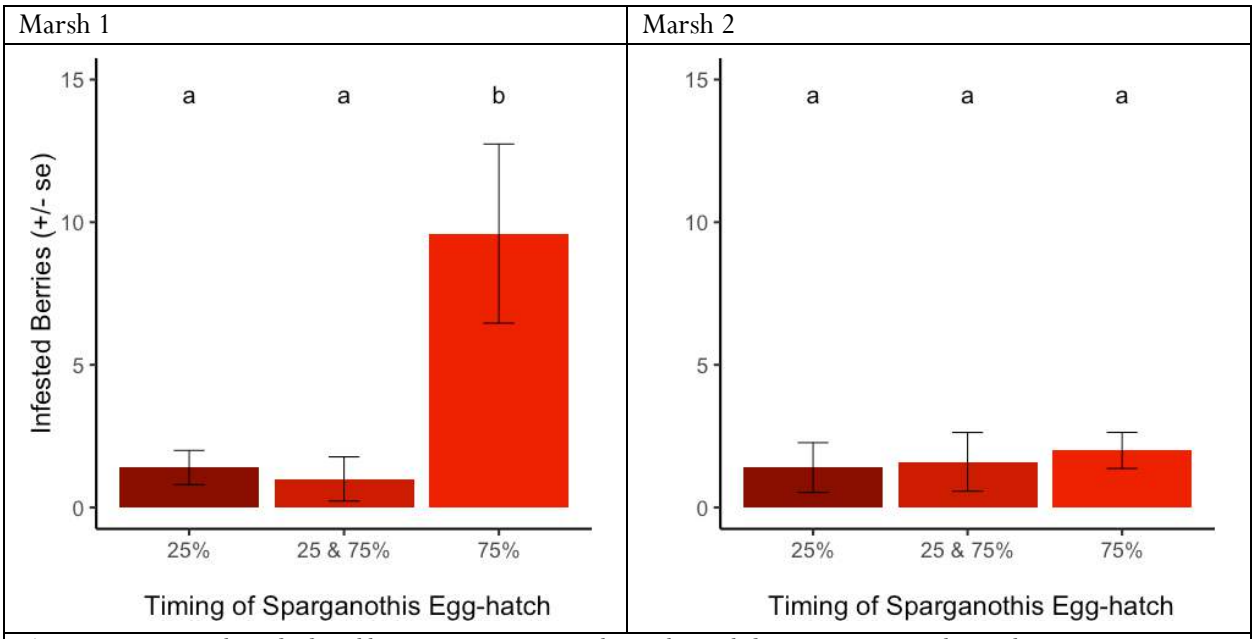


Figure 1. Mean number of infested berries (+/- se) counted at each marsh for treatments timed according to sparganothis egg-hatch. Letters above bars represent statistical differences between means.

DISCUSSION

At marsh 1, applying insecticide at 25% sparganothis egg-hatch provided greater pest control than applying at the 75% egg-hatch benchmark. Additionally, applying insecticides at both egg- hatch timings did not decrease incidence of infested berry damage compared to the early application alone. This suggests that the 25% timing works so well that following up with a 75% timing may not be cost-effective.

At marsh 2, monitoring traps show that sparganothis fruitworm populations dropped off to zero after July 3. Without moths present, it becomes impossible to show treatment effects. Not surprisingly, then, at this

marsh we saw no difference in infested berry counts between any of the treatment timings. This is a good reminder that it is important to use both trap-catch data along with degree-day benchmarks to make informed insecticide application decisions.

Differences in daily temperatures between the two sites resulted in degree-day accrual divergence and subsequent insecticide application timings. For the 25% sparganothis egg-hatch benchmark, the timing differed by just four calendar days, but the timing for the 75% egg-hatch benchmark diverged by 12 calendar days. These variations underscore the need to record marsh- specific weather data.

At this point, we have gathered strong evidence that suggests insecticide applications timed for earlier during the egg-hatch period (at 25% egg-hatch) provides better pest control than later applications (75%). Future studies will further elucidate differences in pest control from applying insecticide at smaller DD intervals.

1. Rice, R. E.; Weakley, C. V; Jones, R. A. Using Degree-Days to Determine Optimum Spray Timing for the Oriental Fruit Moth (Lepidoptera: Tortricidae). *J. Econ. Entomol.* **1984**, *700*, 698–700.
2. Sjöberg, P.; Swiergiel, W.; Neupane, D.; Lennartsson, E.; Thierfelder, T.; Tasin, M.; Rämert, B. Evaluation of Temperature Sum Models and Timing of *Quassia amara* (Simaroubaceae) Wood-Chip Extract to Control Apple Sawfly (*Hoplocampa testudinea* Klug) in Sweden. *J. Pest Sci. (2004).* **2015**, *88*, 301–310.
3. Deutsch, A. E.; Rodriguez-Saona, C. R.; Zalapa, J. E.; Steffan, S. A. Temperature-mediated development thresholds of *Sparganothis sulfureana* (Lepidoptera: Tortricidae) in cranberries. *Environ. Entomol.* **2015**, *44*, 400–405.
4. Deutsch, A. E.; Rodriguez-saona, C. R.; Kyryczenko-roth, V.; Sojka, J.; Zalapa, J. E.; Steffan, S. A. Degree-day benchmarks for *Sparganothis sulfureana* (Lepidoptera: Tortricidae) development in cranberries. *J. Econ. Entomol.* **2014**, *107*, 2130–2136.

Grapes

Buds are swelling, watch for grape flea beetle

By: Christelle Guédot, UW-Madison

Buds are starting to swell and spring is here, which means that insects are also starting to pop their heads from their overwintering habitats. It is the time of year to start thinking about our spring insects and in particular, grape flea beetle which was quite abundant last year. You should begin scouting for flea beetle and cutworm damage in the next couple of weeks. Flea beetle is a small beetle while cutworms are moths but the damage caused by either one of them can look quite similar. Please refer to this previous article to contrast the two insects and apply the appropriate control measures depending on which one is causing most of the damage in your grapes.

Grape flea beetle adult.

Flea beetle is a small insect that feeds as an adult directly on swelling buds during the day. They are easy to see and identify from their small size and metallic blue appearance (see photo to left). The spring generation is the only one that may cause economic damage. 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. Several insecticides can be used to control flea beetle, including Baythroid XL, Danitol, Sevin XLR Plus, and Scorpion. Happy growing season!

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.

Organic Methods To Promote Branching In Nursery Apple Trees

By: Chris McGuire, Two Onion Farm, farmer@twoonionfarm.com

We raise organic apples on our farm in southwest Wisconsin. Like many organic growers, we've experimented with grafting and raising our own planting stock. It's difficult to buy organically grown planting stock. Although organic standards permit planting non-organic trees, many organic growers prefer to graft and raise their own trees organically to reduce reliance on synthetic products and/or to grow uncommon varieties which are not readily available through commercial nurseries.

However, it's proven difficult to raise well feathered trees on our farm. Planting feathered trees increase yields in the first years of the orchard and speeds up return on investment. Commercial nurseries generally use chemical plant growth regulators (e.g., Maxcel, Promalin, and Tiberon) to promote branching and to produce feathered trees, but these products are not permitted in organic production.

With funding from a USDA-SARE Farmer Rancher grant, we evaluated organic methods of promoting branching in nursery trees. We compared manual leaf removal and organic cytokinin sprays to an untreated control. Manual leaf removal means repeatedly tearing off young leaves near the growing tip of the tree – these leaves produce auxin which suppresses lateral buds from developing into branches. Organic cytokinin sprays are derived from seaweed and we thought that they might work similarly to the synthetic cytokinin in Maxcel.

We bench-grafted sixty trees each of nine varieties onto G.41 rootstock in March, 2018 and raised them in a high tunnel during the 2018 growing season. We applied 2" of finished compost before planting to the entire tunnel, we mulched the trees heavily after planting with hardwood bark, we irrigated as needed with drip irrigation, and we controlled vegetative pests as needed with OMRI-listed pesticides. We trained the trees using standard procedures: we singulated all trees to a single shoot from the scion, we removed all branches below 22" above the graft union, and we tied the leader to a bamboo stake as it grew. Our entire farm, including this nursery, is certified organic.

We applied one of three treatments to each tree:

(1) Untreated control

(2) Tear off 3 young developing leaves near the growing tip three times, two weeks apart, starting when leader reached 22" above graft union

(3) Spray Sea Crop 16 three times, two weeks apart, starting when leader reached 22" above graft union, at maximum label rate (2 cups/gallon water) to 8-10" at the top of tree. (Sea Crop 16 is an OMRI-listed plant growth regulator produced by North American Kelp, Waldoboro, ME. We selected it because it had the highest cytokinin concentration of any organically-approved plant growth regulator which we are aware of. Note that this maximum label rate of Sea Crop 16 results in 50 ppm cytokinin, which is only 10-20% of the concentration of cytokinin which is typically used when Maxcel is sprayed to promote branching in conventional nurseries).

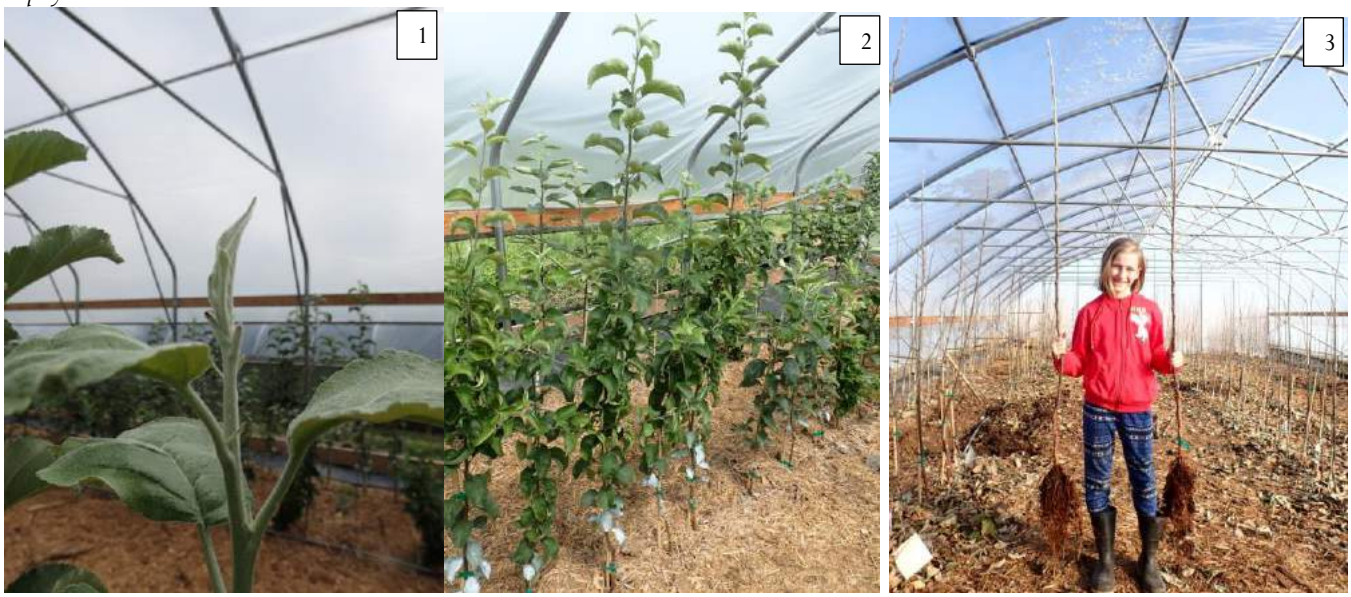
At the end of the season we measured tree height and the number and length of all feathers >4" in length. For planting in the tall spindle system, trees will ideally have 10-15 feathers >4" in length. Statistical analysis showed the following trends:

- Taller trees had more feathers. For each increase in tree height by 6", a tree typically had one more feather.
- Varieties differed greatly in branching. For example, Golden Russet had about 5 more feathers per tree than other varieties such as Macoun and Hudson's Golden Gem.

- Leaf removal promoted branching, and the Sea Crop 16 spray actually reduced branching. But the effects were small: compared to the control, leaf removal increased the number of feathers per tree by 0.9, and spraying decreased the number by 0.7. We don't know why the seaweed spray would have reduced branching, but it is a complex naturally-derived product which may have other active compounds beside cytokinins. The treatments did not affect average feather length.
- There was a wide variation in tree growth above the graft union, from 2.5' to 8'. In general, grafts grew more than is typical for outdoor nurseries in our experience. Treatment did not affect tree height, but varieties differed significantly in height.

The cost in materials and labor for raising a tree in this system was approximately $12, excluding overhead costs and costs of facilities and equipment; the different treatments to promote branching had minor effects on the overall cost of raising a tree. We would recommend removing young leaves because although the effect was small, the cost in labor was minor. However the cost of raising trees in this system was considerable and may be more than the cost of purchased trees, so growers should probably consider carefully the costs and benefits of raising trees on-farm vs buying their planting stock.
A detailed report of our results is available online at www.twoonionfarm.com/research/ and I am happy to answer questions by email: farmer@twoonionfarm.com.

Disclaimer: This product was developed with support from the Sustainable Agriculture Research and Education (SARE) Program, which is funded by the U.S. Department of Agriculture – National Institute of Food and Agriculture (USDA-NIFA). Any opinions, findings, conclusions, or recommendations expressed within do not necessarily reflect the view of the SARE program or the U.S. Department of Agriculture. USDA is an equal opportunity provider and employer.



1) Tip of a leader four days after leaf removal treatment was applied. Notice the petiole stubs where leaves were removed.
2) Trees growing in the nursery.
3) Two newly dug Grimes Golden Trees in December

Prebloom Micronutrient Management in Apples

By: Amaya Atucha, UW-Madison Department Horticulture

Micronutrients (i.e., boron, zinc, manganese, iron, copper) although needed in very small quantities compared to macronutrients (i.e., nitrogen, phosphorus, potassium, calcium, magnesium) play a critical role in pollen germination, fruit set, and fruit and tree growth. Here are a few recommendations for boron and zinc fertilization during prebloom.

Boron is essential for the normal development of new shoots, flowers, fruits, and roots. It is also a key element for pollen germination and fruit set. Deficiencies of boron are common in orchards in Wisconsin, especially in coarse-textured soils, with high pH, and low organic matter. Tissue analysis is the best diagnostic tool to determine boron levels in apple trees, and leaf concentrations of 30 to 50 ppm of boron are required for normal tree performance. The most common deficiency symptom is corking and cracking of fruit, reduced growth and dieback of new shoots and roots, early fruit ripening, and significant pre harvest fruit drop. Poor root development, as a result of the boron deficiency, limits the uptake of various other nutrients such as potassium and calcium, thus low levels of boron are often associated with calcium deficiency problems. Fruit set is also reduced on trees that have low boron levels because of poor pollen germination and pollen tube growth.

Boron can be applied to the soil or with foliar applications. Foliar applications have shown and additional benefit of increasing calcium levels in the plant. The most common product used for either soil of foliar boron fertilization is Solubor. Foliar applications of Solubor are recommended at one pound per 100 gallons dilute equivalents. Depending on the foliar levels of boron more than one application is recommended starting at 1/2" green followed by a second one at tight cluster to pink.

Zinc deficiency is one of the most common deficiencies in Midwest orchards. Zinc is relatively immobile within the soil and is not available for plant uptake in high pH and/or high phosphorus in the soil. Zinc is involved in hormone production in buds that stimulates shoot and fruit growth. Zinc deficiencies results in poor leaf and shoot growth, poor fruit set, reduced size and color of fruit. In addition, zinc plays an important role in reducing frost damage of flowers. Foliar application of zinc chelate products starting at 1/2" green is the most cost-effective way of providing this element to apple trees.

Zinc chelate and Solubor can be tank-mixed with urea. Solubor should not be tank-mixed with oil or with any pesticides contained in water-soluble plastic packages because it inhibits the dissolution of the plastic. Solubor will increases spray water pH, an acidifying agent might be needed if Solubor is used with pH sensitive pesticides.

Finally, if the results of the leaf analysis show low levels of zinc and boron, a combined application of 1 lb of Solubor, 3 lbs of urea, and Zn-EDTA at label rate per 100 gallons @ 1⁄2" green followed by a second application at tight cluster to pink is recommended.

Dog wood borer and mating disruption

By: Christelle Guédot, UW-Madison

Spring is in the air and if you have not already done so, this is the time of year when you should be ordering traps and other supplies for monitoring and managing insect pests in apple. One management strategy we discussed as a viable option for several of our insects at the summer field day last August is mating disruption and you can find a previous article of the WFN where we discussed this topic.

Some growers have considered using mating disruption for dogwood borer (DWB; photo to the right). This clear wing moth lays eggs in burr knots and can cause severe damage to tree trunks and tree vigor. More info about DWB and other borers can be found in this article. Mating disruption is available commercially as the DWB Isomate product from Pacific Biocontrol; however it is NOT CURRENTLY REGISTERED in Wisconsin.

It came to my attention that some Wisconsin growers may be purchasing DWB mating disruption dispensers and using them here. While these may be available from neighboring states or online, it is against federal law to use these products in a state where they are not legally registered with EPA. Please, make sure to ask your suppliers (especially if you purchase online) if any of the products you are considering to purchase are registered in Wisconsin. You can also check registration status in Wisconsin by going to the DATCP website and check their pesticide data base for current registration status or you can contact me at guedot@wisc.edu or 608-262-0899.

Now, I am currently in conversation with Pacific Biocontrol, the maker of DWB Isomate to investigate the possibility of them registering this product in Wisconsin. Conversations have been fruitful as they just told me last Friday that they are pursuing the process to register DWB Isomate in Wisconsin. The process will take some time and I will keep you informed as soon as it is registered in Wisconsin as I will continue communicating with the manufacturer to provide a new strategy for apple growers in Wisconsin for managing DWB.

Happy growing season!

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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