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Cranberry Crop Management Journal

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IN THIS ISSUE:

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Evaporative cooling to reduce heat stress in cranberry.

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Evaporative cooling refers to the practice of cooling plants on very hot days by turning on sprinkler irrigation for a short period of time, usually less than 30 minutes, once a critical temperature threshold has been reached. This technique is not new, and it has been successfully used in many crops. A recent study in cranberries (Pelletier et al. 2016), determined that the critical *leaf temperature* at which sprinkler irrigation should be turned on to avoid heat stress and maximize photosynthesis is 91 °F, which corresponds to an *air temperature* of 82°F at a 6 ft height. The study also determined that a 20-minute cooling period could decrease *leaf temperature* by 9 to 18°F, when the initial leaf temperature was at 91°F. The decrease in leaf temperature by using evaporative cooling will depend on relative humidity and wind conditions. When relative humidity is high, evaporative cooling will be less effective in decreasing leaf temperature.

During a regular day in the growing season, lets say mid-July, net photosynthesis increases steadily from sunrise until mid morning, 10-11 am, and then it declines by approximately 50% by 1 pm. This phenomenon is referred to as "midday depression" (Hagidimitriou and Roper, 1995; Kumudini, 2004), and it is related to heat stress. The same study by Pelletier et al. (2016) showed that evaporative cooling could help reduced the negative effects of midday depression in cranberry, similar to results in other crops.

It is important to point out that these studies were looking at leaf temperature as the reference for heat stress, but we also need to consider the effect of heat stress on fruit. In general, *fruit temperature* can be 10-15°F higher than the canopy temperature on a hot sunny day. Fruit tends to be more exposed to the sun in the new high-yielding cultivars (e.g., 'Mullica Queen') because of a less dense canopy, increasing the chances of fruit overheating, leading to fruit scald.

In summary, evaporative cooling is an effective strategy to alleviate heat stress in cranberry. The temperature threshold for heat stress damage has been based on leaf temperature, but growers should take into consideration that fruit temperature will be higher than that of leaves. In addition, vines should be properly irrigated, as heat stress is worsened by water stress.

Not a hot day but still cooling.

Cited literature

Hagidimitriou, M. and Roper, T.R., 1995. Seasonal changes in CO_2 assimilation of cranberry leaves. Sci. Hortic. 64: 283–292.

Kumudini, S., 2004. Effect of radiation and temperature on cranberry photosynthesis and characterization of the diurnal change in photosynthesis. J. Am. Soc. Hortic. Sci. 129: 106–111.

Pelletier, V., Pepin, S., Gallichand, J. and Caron, J. 2016. Reducing cranberry heat stress and midday depression with evaporative cooling. Scientia Horticulturae. 198: 445-453.

Movento insecticide for tipworm management

Christelle Guédot
Fruit Crops Entomologist, University of Wisconsin

Movento is registered for use in Wisconsin on different crops including cranberry. It was registered around 2008 so you may have some experience with it. It is marketed by Bayer CropScience under the formulation 2SC (2 lb. of active ingredient per gallon as a Suspension Concentrate). Movento is in the class of the lipid biosynthesis inhibitors (IRAC group 23) with a mode of action that inhibits the acetyl Coenzyme A carboxylase. Movento contains the active ingredient Spirotetramat. Movento is active primarily through ingestion of treated plants against immature pest life stages. Fertility may also be reduced in adult female pests, such as aphids. Once applied to foliage, Movento is fully systemic, moving upwards and downwards through xylem and phloem to new shoot, leaf and root tissues. It is most effective against sucking insects found above and below ground.

Movento is registered for control of several insects including aphids, cranberry tipworm (also known as blueberry gall midge), thrips, and leafhoppers. Of interest to us in cranberry production is its efficacy against tipworm.

We have been conducting trials for several years now with Movento and have tested it against most of our common pests in cranberry. To date, it has shown **excellent efficacy against tipworm** consistently throughout our trials. Unfortunately, Movento does not have efficacy against any of our other common pests in cranberry.

Movento may be applied by ground equipment, chemigation, and by air (see label for specific application regulations). It is highly recommended to mix Movento with a spray adjuvant with spreading and penetrating properties to maximize leaf uptake and systemicity (see label for more detail).

In cranberry, do not apply prior to petal fall due to the need for sufficient leaf tissue to be present to allow uptake and translocation of Movento.

Movento is potentially toxic to bee larvae through residues in pollen and nectar but not to adult bees. As a precaution, avoid applying any pesticide during bloom when bees are flying.

Movento is toxic to aquatic invertebrates and oysters and must not be applied directly to water.

As always, make sure to read the label before using any pesticide. You can find the label of Movento at the following link: https://s3-us-west-1.amazonaws.com/www.agrian.com/pdfs/Movento_Label1j.pdf

Insecticide: Movento

Available as 2SC (2lb AI, Suspension Concentrate)

Restricted re-entry interval (**REI**): 24hours

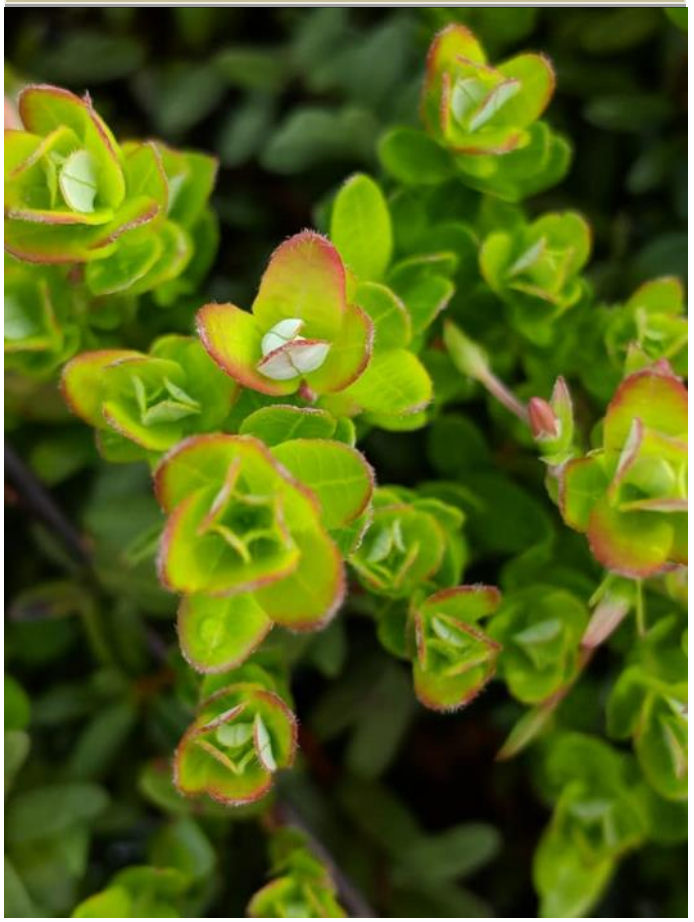
Pre-harvest interval (**PHI**): 7 days

Do not exceed a total of 30 fl. oz. per acre per year

Rate of use per acre: 8 – 10 fl. oz.

Minimum interval between applications is 7 days

Do not apply until after petal fall



Leaf cupping due to Tipworm.
Photo courtesy of Lady Bug IPM, LLC

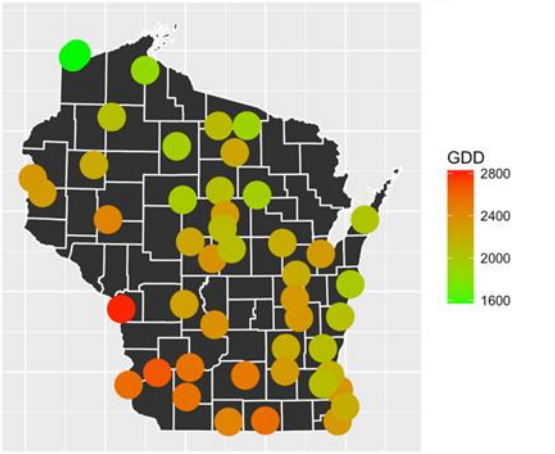
Cranberry Plant and Pest Degree Days– July

Elissa Chasen and Shawn Steffan
USDA-ARS and UW Entomology

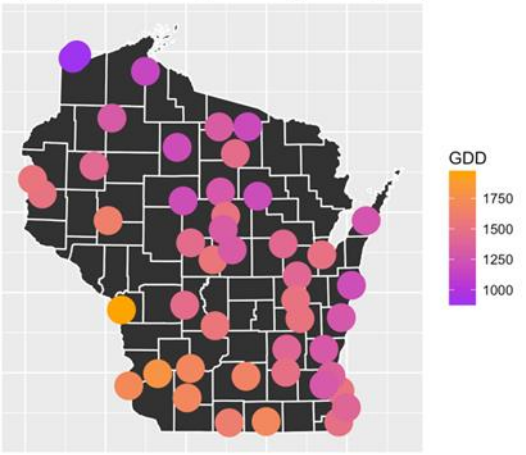
Check out the maps for the degree-days of the cranberry plant and associated pests.

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

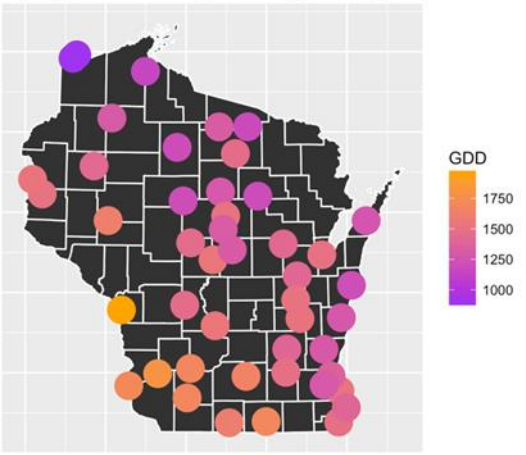
Cranberry Growing Degree Days: July 24, 2018



Sparganothis Degree Days: July 24, 2018



Sparganothis Degree Days: July 24, 2018



July 24	Cranberry DDs			Sparg DDs			CFW DDs		
	2016	2017	2018	2016	2017	2018	2016	2017	2018
Northern WI (Minocqua)	1966.7	1809	2130.9	1162.8	1019.3	1359.8	1678.9	1524.1	1863.7
Central WI (Wisconsin Rapids)	2415.3	2295.6	2411.1	1516	1406.9	1598.7	2092.1	1979	2128.5

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

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

* Egg hatch window: 895 – 1,890 DDs

Based on the predicted life-cycle of sparganothis fruitworm (right), in central WI, we are nearing the end of egg laying.

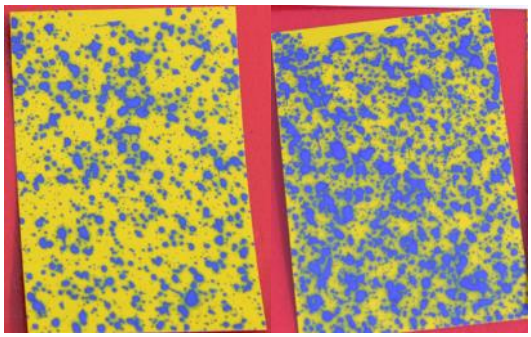
Getting more BANG from your DROP!

Tryston Beyrer
WinField United Agronomist-Wisconsin

Cranberries, like other crops, often require multiple pesticide applications to mitigate stress from weeds, insects, diseases, and nutrient deficiencies, but are applicators getting the most value or BANG from their spray mix? The goal with any spray application is to get the active ingredient being sprayed into the target pest to maximize the likelihood of control. One of the primary challenges with spraying is that equipment selection, weather, tank mix components, and different pest types that can each influence the selection for the most appropriate method for getting spray droplets to land in a way that they will maximize control of the pests present in cranberries. The following are some considerations to increase the likelihood of getting better control from your spray.

Nozzle Selection: Focus on droplet size

Selecting the proper nozzle for the job should consider other factors than just targeted gallons per acre, driving speed, and pressure. Nozzle selection should primarily be based on droplet size that is conducive for the targeted pest, intended coverage, and weather conditions present. One of the simplest methods if increasing coverage is by using a larger spray volume (i.e. minimum of 15 to 20 GPA). Each nozzle manufacture likely has a different drop size categorization (i.e. Very Fine, Fine, Medium, Course, etc.) so nozzle selection should be based on the droplet size, or Volume Median Diameter (VMD). Ideally a nozzle would produce all spray droplets of the same size; however, spray droplets produced by an individual nozzle can vary and thus we use the VMD to assist with nozzle selection. Unfortunately, all nozzles produce a range of droplet sizes which makes managing all of the spray droplets difficult. WinField United's new Innovation Center in River Falls, WI has a state of the art wind tunnel system that uses a precision laser analytical imager to assess how nozzle selection among many other variables influence spray pattern distribution.



Photographs illustrating coverage differences between 10 GPA (left) and 20 GPA (right) with the same nozzle.

Nozzle selection is frequently a balancing act between increasing coverage and minimizing drift. As an overarching rule, generally soil applied herbicides have increased performance with larger spray droplet sizes (400-650 µm) while fungicides and insecticides perform better with increased coverage with smaller droplet sizes (150-300 µm). Droplets that are too large can bounce off the targeted plant or have minimal spray coverage while spray droplets that are too small may drift or move off target and never contact the pest. The advantage of using smaller spray droplets is the surface area of each droplet is drastically greater than larger spray droplets which can be important when increasing spray coverage for targeting small pests, but we must get the product to the pest. Since the VMD is the Median droplet size, some droplets will be larger and smaller than that range. When using finer spray droplet nozzles, there is a high probability that a certain percent of your droplets will be less than 150 µm, which significantly increases your chance for off target movement of the pesticide. Previous research has shown that a 10 mile per hour wind can blow a 150-micron spray droplet about five feet while a 100-micron spray droplet can move more than 17 feet. Spray droplets less than 50 microns often evaporate, leaving the spray mix active ingredient suspended in the air or moved off target and not on the targeted pest.

Sprayer Calibration

Now that we have selected a nozzle, we need to know that is performing satisfactorily. Calibrating a sprayer and each nozzle helps to identify potential problems with even distribution of the spray. Many applicators may calibrate a sprayer based from knowing a target volume of product and carrier applied to the field and after applying to the field, checks to see if they used what they expected. Unfortunately, even if the calculations come out correct, there can be substantial variability either across the boom, nozzle to nozzle, or within a specific nozzle. Nozzles that may be clogged, worn, or that have spray patterns that hit adjacent spray patterns can all cause uneven spray coverage. The challenge with uneven distribution of spray droplets across a spray boom is that the targeted pests may receive lower concentrations of the spray mix, leading to unsatisfactory control or even worse, a partial control or selection of the pest to become resistant to low concentrations of pesticides overtime.

Additionally, high spray concentrations from nozzles putting out greater spray volume can lead to crop injury. Check each nozzle for consistent spray flow by collecting water for a given amount of time and replace nozzle if variation between tips exceed 5%. Observe each nozzle for even distribution of spray droplets within the spray fan and ensure that nozzle spray patterns do not hit each other.

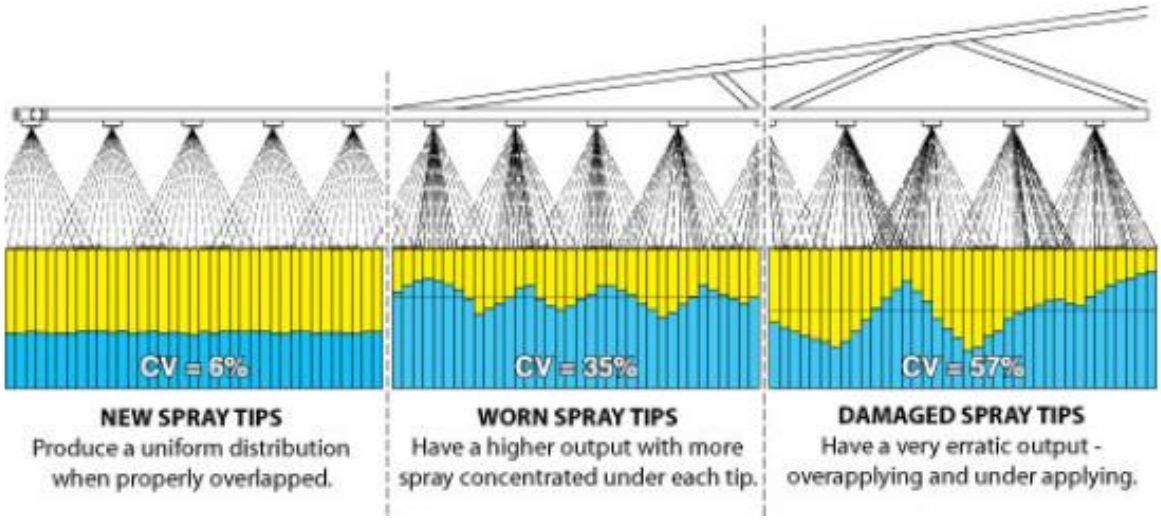
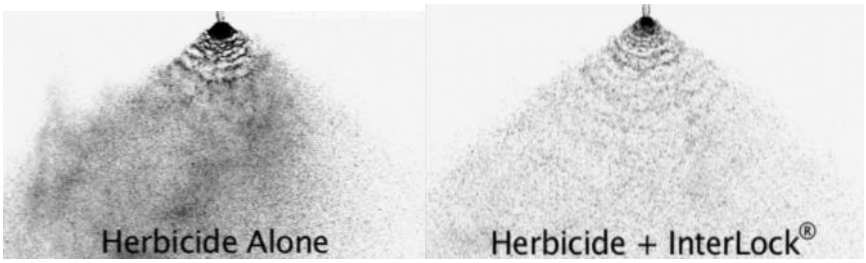


Figure illustrating variation between individual nozzles. (Image source, Tee Jet).

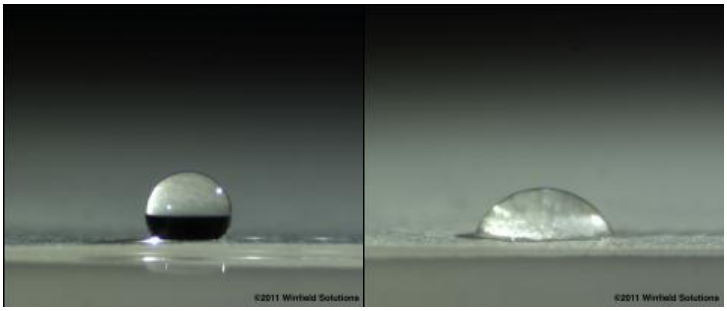


High speed photography from WinField United wind tunnel without (left) and with a deposition aid (right).

What's in your drop?

When spraying the goal is to get the active ingredient of the pesticide to the target pest. But once the product leaves the spray nozzle, many factors such as the weather and the plant canopy can interfere with delivering active ingredient of the pesticide to the target pest. Low humidity and high wind speeds can shrink droplet size and move products away from the targeted pest. Dense plant canopies or physical leaf characteristics such as pubescence or waxy cuticles can restrict movement of the pesticide into the targeted weeds, insects or diseases deep in the canopy. Fortunately, other products mixed in the spray mixture can assist with delivering the product in a manner that it gets into the pest for greater control.

Deposition aids such as Interlock® or Masterlock® were designed to assist the spray droplet from the nozzle to increase contact with the targeted pest. These are formulated in ways different than many polymer drift reduction adjuvants so that droplet size remain more consistent, can penetrate further through the plant canopy, and reduce drift allowing for more active ingredient to contact the targeted pests. Additionally, nonionic surfactants such as Preference® aid in increasing surface area of the spray droplets and decrease spray droplet bounce or roll off the leaf through a reduction in surface tension of the spray droplet.



Photographs illustrating water surface tension without (left) and with a nonionic surfactant (right).

Pesticide applications have many opportunities for the pesticide active ingredient to be applied inefficiently, however, modern spray technology, equipment, and tank mix products can increase the probability of getting increased performance from your spray application. Selecting the proper nozzle, pressure, spray volume, and tank mix partner for the targeted pest and environmental conditions are all factors that may lead to an applicator getting the most BANG from their spray droplet!

In 1952, Wisconsin Farm (Progress) Days was initially designed to take university research findings to Wisconsin citizens on a functioning farm during an outdoor show. The mission of the show was to promote technologies in agriculture and related industries and provide leadership development and education through businesses, industry and agencies. Over sixty years later, in 2018, Wisconsin Farm (Technology) Days is now the largest agricultural show in Wisconsin and one of the largest in the nation. Unlike the cranberry growers summer Field Day where one crop is highlighted, WI Farm Tech Days encompasses all agriculture. It is a campus of Wisconsin farming and this year was hosted in Wood County and cranberries were a natural fit to join FTD. Wood County boasts its strength in the cranberry industry by having 5,000 acres of cranberry vines in production and multiple cranberry food manufacturers in the County.

Cranberries made their impact thanks to the support of the strong WI cranberry community. Thank you to the group of 70+ volunteers from multiple counties/growing areas who carved out time to help support and represent as growers and industry partners in our State's #1 fruit! We couldn't have done this without you! The Cranberry Exhibit was well represented by Wood County agri-businesses and more importantly, along with our volunteers; these agri-businesses helped the Cran Expo come to life.

The Cranberry Marketing Committee, Rubi Reds & WSCGA helped provide educational material, product and the trailer. Mariani Packing CO., Badger State Fruit/Red River Cranberries & Ocean Spray Coop helped us sample 63 cases of juice & shared 50 cases of sweet & dried cranberries. To ensure we had fresh good-looking berries for the bog, we used 3 bins of presorted frozen cranberries, thank you Gardner family for daily berry deliveries. We thank you for sharing the cranberry platform with us at Farm Tech Days. It proved to be a Crantastic Expo!

The feedback from visitors, exhibitors, and FTD Committee Members were unanimous; our Bog Experience was a huge hit for FTD and it helped secure record attendance in over 10 years with a smashing 42,220 visitors while the Cranberry Expo saw a majority of the attendees! Special guests helped us make our Expo "The Attraction" for Farm Tech Days. We created a buzz big enough for Governor Walker & Secretary of Ag. Sheila Harsdorf, who made special visits for a bog stop on their FTD Tour. Thank you to Miss Wisconsin Rapids, Hannah Ashbeck, Miss Wisconsin, Tiana Vanderhei, & Green Bay Packer, Vince Biegel, who helped draw a crowd to the Cranberry Exhibit!

The media coverage for FTD opened a window for the Cranberry and we worked hard to design our Expo to be the center stage for the Wood County Agri-Community, and it worked! The Country Today, Agri-View, Wisconsin Rapids Daily Tribune, Marshfield News Herald, Focus on Marshfield, Wisconsin State Farmer, WSAW Channel 7 and News 9 WAOW are just a few media channels we know of and we're in the process of compiling the analytics from the media outreach and will report on this as soon as it's completed.

For Wood County, this was a unique and special opportunity to showcase, celebrate and share our farmer story and the vitality farming businesses brings to a community. Our vines have an outreach beyond individual farms and our participation with FTD illustrated the role The Cranberry has in Wisconsin farming.

We know when farmers are united we are strong in numbers. Whether you're a Wisconsin farmer or grower, we have a rich history & heritage we strive to honor. We long for a vibrant thriving future, we have pride for our farms and we're loyal to protect them. We are perfectionist by instinct and by trade, we are crop experts and yet we are the most eager of students to learn new techniques. We are passion-ate for the land we live and work on, as we respect what we can control and take in stride what we cannot. We value our families and we val-ue one another. We are neighbors and we are interwoven into our communities. We leave our legacy by the decisions we make for our farms and by the relationships we build, nurture and grow. Although our farming practices may be vastly different among crops or product, the common ground among us is the same.

The Cranberry Exhibit accomplished all of this. Our goal was to tell our grower story, how cranberries are grown, harvest techniques, the evolution of our machinery and the versatility of the cranberry. Cranberry Growers of Wisconsin, we all ought to be proud of the impact we had at Farm Tech Days this year. It was unprecedented and a once in a lifetime experience. Where do we go from here?

The Cranberry Exhibit was designed in a way that some of the materials are reusable for a future use. The Welcome Booth (thank you Hay Creek Companies & Bennett Cranberry for design and installation), Mini 'hand' Bog Station (created by Chris & Lisa Rezin, thank you!), Tent Banners "Cranberry Product" and "Cranberry Education" and Welcome banner, "Want to learn about our #1 State Fruit?" are also available to loan out. Brochure holders for print material, the imitation grass and dry bog signage are also available for use. Most importantly, we now have a blue print for a future set up similar to the Cran Expo, when an opportunity like Farm Tech Days comes to your community. Please contact, Heidi Slinkman (715-213-4828) gaynorcranberry@gmail.com if you wish to borrow these items. To view photos from Farm Tech Days, please visit @explorecranberriesFTD18, https://www.facebook.com/explorecranberriesFTD18/. (more see page 7)

(from page 6)

More reflections of FTD continue to surface. We give an endearing "Thank You!" to any of you who took a moment to share feedback and tell us Thank you, Good Job! I would personally like to thank the Cranberry Exhibit Planning Committee. Grower community, you have great leaders among us, please applaud them when you can: Mary Smedbron, Stephanie Bennett, Nicki Ryner & Ben Rezin. Sincerely, Heidi Slinkman, Chair- FTD Cranberry Exhibit Planning Committee.

Farm Tech Aerial View

OBSERVATIONS FROM THE FIELD

by Pam Verhulst
Lady Bug IPM, LLC

2018 has certainly been an unusual year for our insect pests.

Our pheromone trap counts accumulated faster than any year prior. These flight indicators warned of high fruitworm pressure during fruit set. The slower growing regions are just finishing up their fruitworm insecticide applications.

Cranberries infested with Cranberry Fruitworm Larvae

Tipworm infestations are also being addressed now that the pollinators have moved away from cranberries. A few growers are experimenting with Movento on their high infestations. 2018 is the first year Wisconsin has a label. Preliminary evaluations look good and we're excited to see what this insecticide can do for us against this pest.

Cranberry Flea Beetle Feeding

Now, Cranberry Flea Beetle numbers are reaching economic threshold levels at historically early dates. Knowing their reputation of emerging all the way up until harvest, we are preparing for our small battles. The only positive thing about early infestation is that it broadens growers' flea beetle control options. Insecticides that growers are usually unable to use, due to pre harvest intervals or market restrictions, are an option for them this year. This is extremely beneficial to growers that historically have cranberry flea beetle infestations and are limited year after year on their insecticide options. These growers can have relief in knowing they are now doing their part in preventing any resistance on their property.

Cranberry Flea Beetle

Next, we will be looking for 3rd generation Blackheaded Fireworm (BHFW). If the season continues on this unusual path we may also have to address them.

Blackheaded Fireworm (BHFW) adults in pheromone trap and BHFW egg on the back of a cranberry leaf.

GROWER UPDATES

GAYNOR CRANBERRY COMPANY

The bees have come and gone and now we have fruit set! I am thankful for the almost perfect weather we had in June and July for our pollinators. I always feel this time of year can be an emotional roller coaster as we get very excited and emotional as the blossoms appear and then a brief moment of panic as the blossom transitions to pin heads and you wonder " Do I have a crop out there?!" But then almost overnight baby berries appear and the feeling of excitement appears for this years crop! We are winding down our fertilizer applications as well as our pest management. We are entering the time of year when we literally watch the fruits of our labor come to fruition.

I had the opportunity to volunteer and hand out product samples at Wisconsin Farm Technology Days cranberry exhibit. I'd like to applaud my sister, Heidi Slinkman and her all grower committee for their job on the exhibit. It was the talk of the show and unlike anything I had seen before. Farm Tech Days was an unreal event and I'm so proud to have cranberries be the star of the show.

In the next few weeks, I look forward to our crop size and color. I also look forward to start planning our harvest. I anticipate our hybrid varieties to be ready in late September. For me fall means two things...cranberry harvest and FOOTBALL!

Go Pack Go!

Jenna Dempze

JAMES POTTER CRANBERRY MARSH

Celebrating the 4th of July never felt so rewarding for our family. After a very long spring, with many setbacks, we finally got our renovation projects complete. We got the last of our vines planted and began watering them in on the afternoon of July 3rd. It felt great!

Of course, renovations aren't all we have been working on. The boom at our Spring Valley marsh crumbled, so we spent a couple weeks building them a new one. I'm thankful for the skilled welders in our family! We are now on the home stretch with our fertilizer program. We also have been working to keep the pests and weeds under control. Our buzzing little pollinators are now gone, so working out in the beds is a lot easier. As grateful as we are for the honey bees, we are sure happy when they leave.

Sandy Nemitz

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Another Farm Tech Day moment, cran-crew rubbing shoulders with the governor.

References to products in this publication are for your convenience and are not an endorsement of one product over similar products. You are responsible for using pesticides according to the manufacturer's current label directions. Follow directions exactly to protect the environment and people from pesticide exposure. Failure to do so violates the law.