Integrated Cranberry Crop Management for Wisconsin

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ATMOSPHERIC NITROGREN FIXATION: UPDATE FROM PREVIOUS ISSUE

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Although nitrogen fixation through lightning can account for 5-8% of the total nitrogen fixated from the atmosphere into the soil, this nitrogen is not immediately available to cranberry vines. As a result of the reaction between lighting and N_2 gas in the atmosphere, nitrogen oxides (NO_x) are formed and incorporated into the soil through rain (Figure 1). Cranberries vines uptake nitrogen preferentially as ammonia (NH_4) and many extension publications report that vines are not able to uptake nitrogen in other forms (i.e. nitrate, organic nitrogen, nitrogen oxides). However, cranberry roots have a beneficial relationship with mycorrhizal fungi, which are able to uptake nitrogen in several forms (i.e. nitrate, organic nitrogen) and consequentially allows cranberry vines to utilize this sources of nitrogen even if it is not as ammonia. Mycorrhizal fungi colonizes the roots of cranberry vines naturally, as the mycorrhizal fungi are present in the water and soil of cranberry marshes, and help cranberry vines uptake nutrients that otherwise would not be available to them.

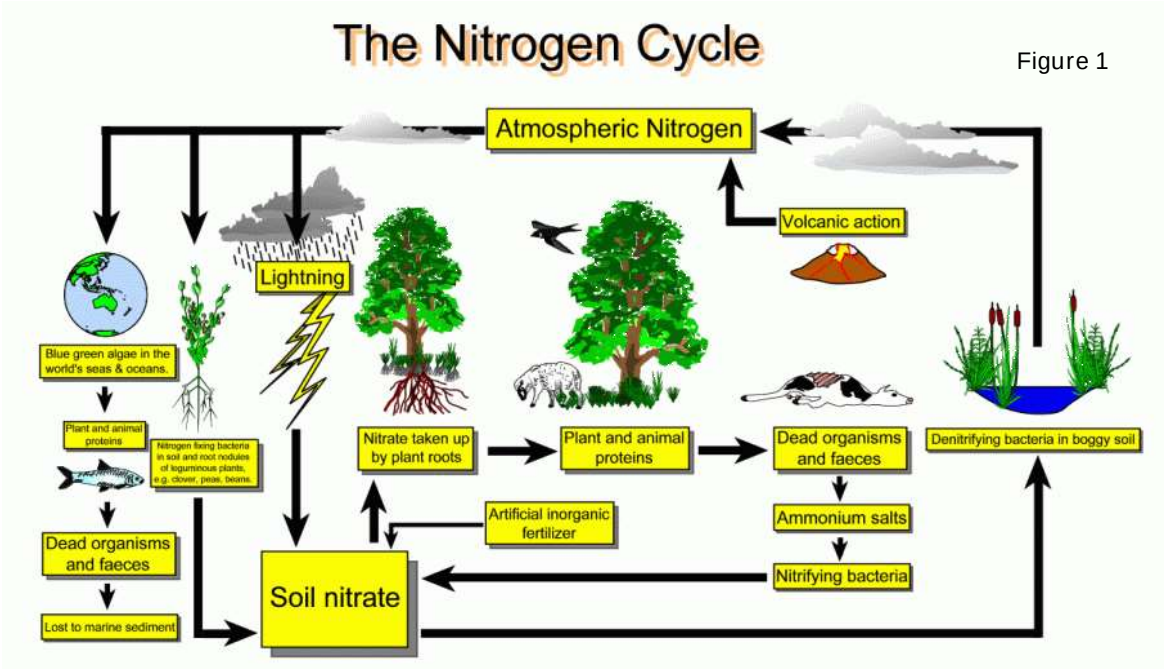

Figure 1

ADDRESS CORRECTION

Contact us if you have any address corrections, additions, or deletions.

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New Data on Flea Beetle Management in Cranberry

Shane Foye, Elissa Chasen, Shawn Steffan
USDA-ARS and UW Entomology

For years, the Steffan Lab has been searching for effective, durable approaches to the control of flea beetles. Because flea beetle adults emerge continuously throughout the latter half of the summer, attempts to control them via foliar insecticides often need to be repeated several times, making pest control more expensive (and less cost-effective). In addition, these late-season applications can be problematic as harvest dates approach and residues in fruit become a concern. For these reasons, we have been looking at ways to target flea beetles earlier in the season while they are still feeding below-ground as larvae. This summer, we looked at two possible control solutions.

Figure 1. The adult cranberry flea beetle (also known as the red-headed flea beetle).

I. The first trial compared the efficacy of native WI nematodes to the best soil-soak insecticides currently known for cranberry flea beetles. For this trial, we tested a new nematode species (to be named *Oscheius wisconsini*) that was recently discovered in central Wisconsin marshlands. Previously, we have shown that this nematode readily hunts and kills both sparganothis fruitworm and cranberry fruitworm larvae (Foye & Steffan 2016, Proceedings of Winter Cranberry School, 2016).

Figure 2. A dead sparganothis fruitworm, with hundreds of white, thread-like nematodes emerging and crawling away.

This summer, we investigated the nematode's ability to control flea beetle larvae within commercial cranberry sods. Flea beetle mortality achieved with the native nematode was compared to mortality associated with the insecticides, Belay WSG ® and Diazinon AG 600®, along with an untreated Control. These four independent treatments were each replicated 10 times. This trial was completed using 40 one-square-foot sods donated from a Wisconsin cranberry marsh with a history of severe flea beetle infestations. Nematodes were applied at a rate of ~90,000 nematodes per sod (typical density of nematodes in marsh/bog habitats), and insecticides were applied at the top of their respective label rates. All sods (including the untreated control) received 400 ml of water to move the applications through the soil profile. The sods were stored in mesh cages, kept in greenhouses, and inspected daily for adult flea beetles until the flea beetle populations had stopped emerging.

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NEW DATA ON FLEA BEETLE: (CONTINUED)

Our results show that the nematodes significantly reduced flea beetle numbers below those of control sods. Furthermore, there was no significant difference among the nematode or insecticide treatments (Fig. 3).

Our future work aims to determine an efficient mass production system and an economically viable nematode application rate. One interesting observation related to this trial is that very few arachnids were found in the canopies of Belay and Diazinon enclosures, but similar numbers of spiders were found between control and nematode cages. This finding suggests nematodes may pose less risk to the natural enemies, thereby helping to contribute to pest suppression down the road.

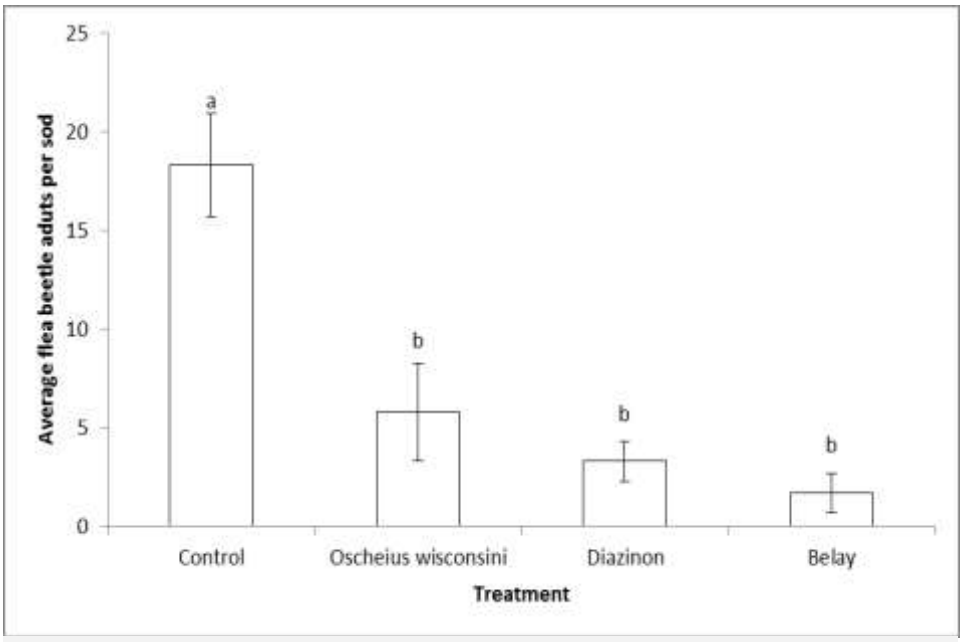

Figure 3. The average number of adult flea beetles that emerged from sods treated with 1) a water control, 2) Oscheius wisconsini nematodes, 3) Diazinon, or 4) Belay. Different letters denote significant differences in terms of mean flea beetle counts ($p < 0.05$).

II. The second trial we completed this summer was a farm-scale field study comparing flea beetle populations in beds treated with an insecticidal soil-soak versus untreated control beds. In this study, 12 large beds with a history of flea beetle pressure were randomly assigned to either a Belay soil-soak or left as untreated controls. Belay was applied just after bees were removed from the marsh (July 25), at 12 oz/acre and irrigated for 2 -3 hours following the application.

Adult flea beetle populations were assessed via five sets of 20 sweeps in each bed in early August. Results (Fig. 4) show that beds treated with the Belay soil -soak had significantly fewer adult flea beetles. This suggests that we were able to effectively penetrate the soil profile with Belay, and that this was an effective insecticide for suppressing flea beetle populations in Wisconsin.

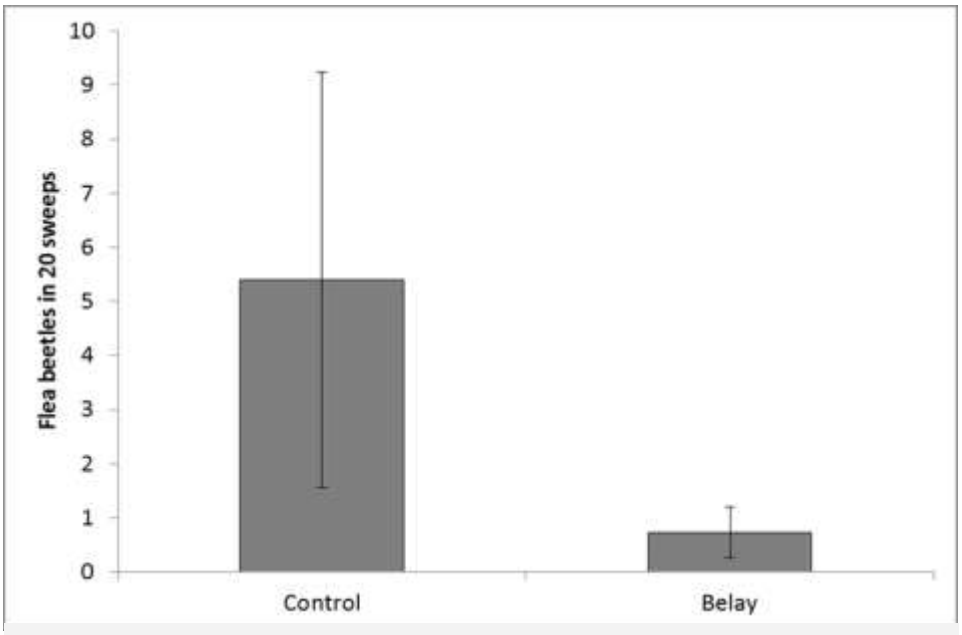

Figure 4. Adult flea beetles collected via sweep nets in cranberry beds with and without Belay.

BUILDING UP RESERVES FOR NEXT YEAR'S GROWING SEASON

Amaya Atucha
UW-Extension Fruit Crop Specialist

As harvest approaches, many growers are thinking about what they can do to prepare their vines for the upcoming winter season. How can we encourage the accumulation of reserves in vines to have a better start next growing season? Cranberry vines accumulate reserves in the form of carbohydrates (e.g. starch, sucrose, fructose, etc.) that are produced by leaves through photosynthesis. During early spring, after ice-off, the concentration of carbohydrates increases in uprights. Older leaves are still active and producing carbohydrates through photosynthesis, yet there is very low consumption of carbohydrates because at this point the vines are not actively growing, which allows the surplus to accumulate as reserves (Figure 1).

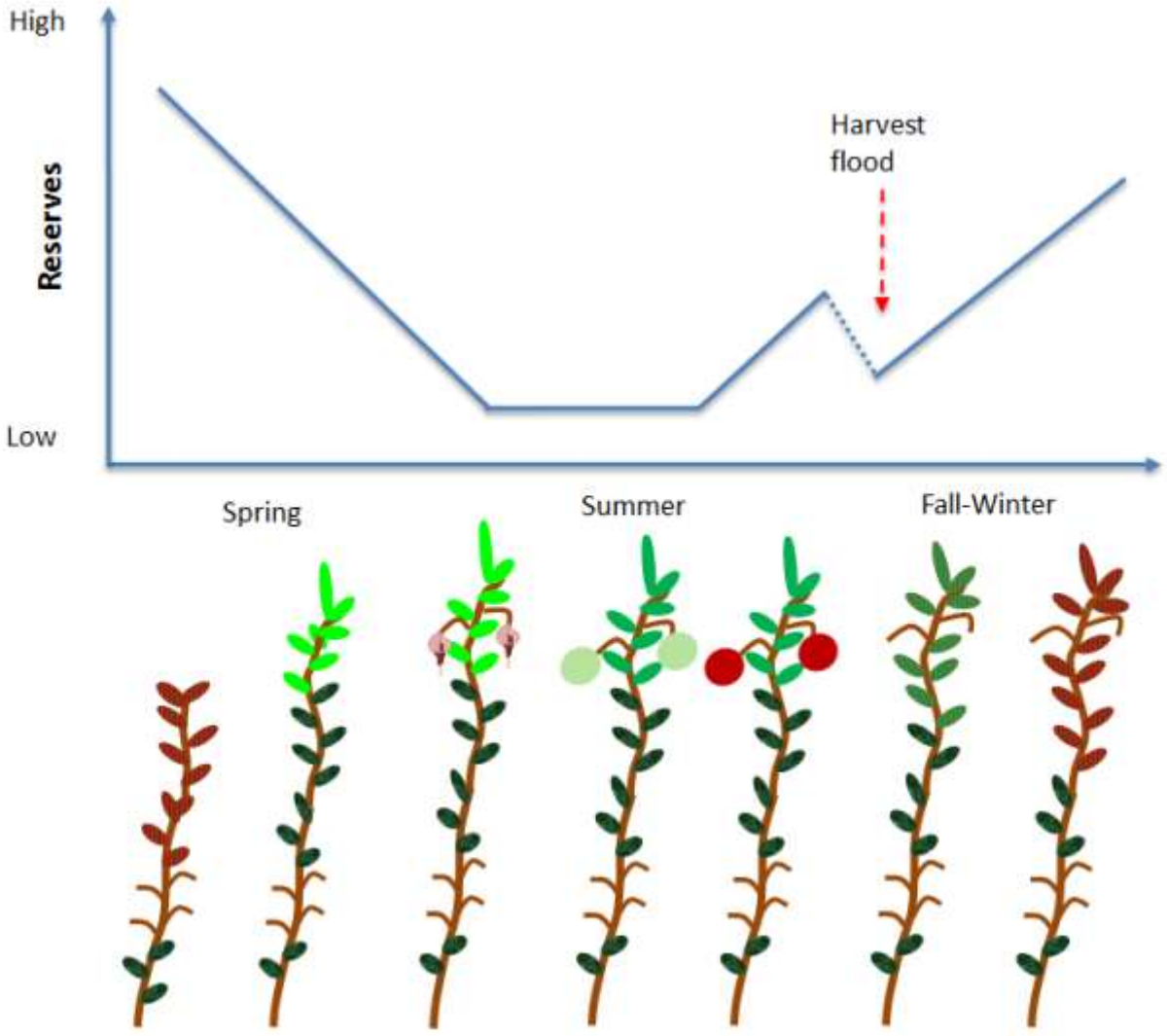

Figure 1. Carbohydrate reserve levels in cranberry uprights from Spring to Winter.

However, by bloom time the reserves of carbohydrates have decreased sharply to their lowest point, as most of it has been used to support new vegetative growth, flower development and fruit set, initial fruit growth, and new root production. Carbohydrates levels remain low from this point until mid-August, as there is a high demand for carbohydrates being produced by new leaves that will support fruit set and fruit growth. In late August, the fruit has already achieved maximum size, and the demand for carbohydrates is lower, which allows the vines to start building up carbohydrate reserves for the winter and the following spring. In fact, the levels of carbohydrates, in particular

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BUILDING UP RESERVES: (CONTINUED)

sucrose, start building up after August and reach the maximum concentration around November. Uprights are the preferred structure to store reserves during fall, followed by woody stems and roots, which have a lower concentration of reserves. In addition, fruiting uprights also have lower levels of carbohydrate reserves than vegetative uprights, which means that rebudding uprights will have less reserves to support flowering and fruit set than uprights that had not produced fruit the previous growing season.

There are several factors that can influence carbohydrate reserve accumulation in upright during fall. For example, high yields will demand higher resources from the vines and can lower the levels of carbohydrate reserves the uprights will accumulate after harvest. Water stress after harvest can also decrease the photosynthetic capacity of leaves, resulting in lower levels of reserves in vines. A significant cause of stress and reduction on carbohydrate reserve accumulation is flooding. Extended flooding period during harvest and fall can reduce the levels of carbohydrates in uprights. A study looking at carbohydrate levels in uprights before and after harvest flood reported that losses of up to 42% of total reserves have been observed after an extended harvest flood. There are several factors that can intensify the loss of carbohydrate reserves during fall floods: 1) timing of floods, early fall floods will have a more detrimental effect on carbohydrate accumulation than later fall floods; 2) flood duration, the longer the flood, the more carbohydrates are consumed by the vines and less is left for reserves; 3) water temperature, warmer water temperatures will have a more negative impact on carbohydrate reserves in vines than cooler flood water.

How can growers minimize the impact of harvest and fall floods on carbohydrate reserve accumulation?

- Short floods
- Cooler flood water and deeper floods will help keep water temperature down. Recharging of floods with water from reservoirs or other water sources will help reduce water temperature.
- Fall floods should be scheduled as late as possible into the harvest season.

OBSERVATIONS FROM THE FIELD: WEEK OF AUGUST 1ST

Jayne Sojka
Lady Bug IPM, LLC

INSECTS: Fall Cutworm showed up in mid-to-late August, but luckily our Flea Beetle Sprays took care of the challenge before we could even reach economic threshold levels. Flea Beetles have been relentless in 2016. This pest started 10-to -14 days earlier than normal and hatch has not stopped since then! Some of our growers are on the third control measure since July 15th. This pest has been dubbed our number-one pest in 2016. As an adult, you can see the leaf chewing and then the burn look to a bed, but remember these adults are laying eggs for a spring hatch of larvae. These larvae as just as plentiful ,but they are working in the soil. The damage they do is tough to find, as it happens under the surface. Chewing and chewing on the roots and causing uprights to show a bronze color in the spring. Often times, these uprights die and the vine density of our cranberry beds decrease.

Flea Beetle feeding

Late blossoms

PLANT HEALTH: On August 29th we observed yet another bloom. A pretty pastel pink blossom on top of crimson red berries is quite a phenomenon. Our cranberry plants are simply amazing!

At the same moment, however, sunscald has now turned into ROT. Some marshes show more than others. This weather has truly played havoc with our best laid plans of having fungicides in place so that we would NOT see rot issues this growing season. Any fungicide application to control rot at this point in time would be in vain. The duff areas of the

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OBSERVATIONS FROM THE FIELD: (CONTINUED)

beds never dry out. Some cultivars are showing such a heavy crop that we see layer upon layer of fruit out there and some of those layers are showing serious stress right now. Weather conditions can't be avoided.

Untimely rain showers of up to 5 inches in a few hours have caused mayhem in the cranberry beds. Some edges were under water too long despite the tedious efforts of pulling boards quickly.

Bronzed uprights are popping up all across WI. Once again, we have no control over weather conditions. This type of bronzing is NOT true upright die back, but it certainly looks like it. It has been proven that the cranberry plants react when they are too wet, too dry, too hot, and too cold. Once again we are witnessing Mother Nature prune our cranberry beds.

This is late August, but we are observing signs of early dormancy. The tips of the vines are showing a purple hint of color. Often time, we see some early varieties showing maturing fruit with more than a natural blush to that top crop. We also observe brown seeds within that fruit. A great deal of the budding is showing a red color cast as in over-wintering and not a blasting look. However, because the crop is deep and heavy the lower fruit is grass green. Will it color? Does it ever see the elements?

I would like to point out that the growing degree days are way ahead of the 30-year norm. Look out of your truck window and see that the maple trees are showing color as well. See the signs around you— fall is coming fast.

It is the most beautiful sight to see when we observe the early sun dancing on the droplets of morning dew on delicate spider webs. The marshes are simply full of the beneficial spiders of many shapes and sizes. If only pictures could truly show what we see….

Have a wonderful harvest!


Bronzed uprights


Early dormancy

GROWER UPDATES

Adams 73 Cranberry

The official countdown to harvest has begun. Our pesticide reports have been submitted, and harvest equipment has been pulled out of storage.

Historically we start harvest at Adams 73 around the 23rd

Crop potential looks good this year. Some of the beds that looked a little crusty and damaged in May have the potential to be some of the highest yielding beds on the property this year. Many of the growers that I have talked to over the past few weeks have similar stories when it comes to the size of the crop this year.

I am not sure if there will be another newsletter prior to the start of harvest, so I will wish luck now with harvest.

Slow down and be safe!

Jeff Hopkins
Adams 73 Cranberry

Habelman Bros. Tunnel City

Fall colors are starting to show up and the vines are starting to go dormant. Hopefully the fruit quality will be good with all the rain. With the cooler mornings our ground temperature is at 63 degrees. We are at 3026 growing degree days. We hope mother nature is kind to us as we gear up for the harvest season. Hope everyone else has a good and safe harvest.

Steve Schoonover
Team Habelman

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