

CRANBERRY CROP MANAGEMENT JOURNAL

DIVISION OF EXTENSION

Volume 35 • Issue 2

UNIVERSITY OF WISCONSIN-MADISON

May 18, 2022

Genetic Fingerprinting at the Wisconsin Cranberry Research Station: Part 1

By Juan Zalapa, Allison Jonjak

Cultivar contamination—whether by sport seeds that germinated from an unharvested berry, or by impure cuttings used for propagation when a bed was planted—prevents cranberry growers from attaining peak yields. Because low-yielding or even non-yielding cultivars can outcompete high yielding varieties by investing more heavily in vegetative growth than in fruit, cultivar contamination tends to progress over time, and can only be addressed by replanting. When a commercial marsh was selected to become the new Wisconsin Cranberry Research Station (WCRS) in 2017, it provided an opportunity to hone cultivar identification analyses at the same time as informing WCRS about the prospects of continuing to cultivate the existing beds, vs renovation.

Of the 10 beds at the new WCRS, 9 were planted to Stevens and 1 to BG. Based on visual inspections (Fig 1) and yield, some amount of barren berry (a common name for cultivar contamination with non-fruited cultivars) was suspected in the Stevens beds. The genetic fingerprinting analysis that Juan Zalapa's lab performed allowed an opportunity to compare visual cultivar contamination estimates with genetic test results. This dovetailed with the opportunity to compare genetic test results with yield records, and finally inform the decision of renovation for each bed.

Visual estimations were made based on vine color (red/green), vine height (tall/short), and fruit production (fruiting/barren). After the visual estimations were made, 288 samples were taken for fingerprint analysis. Each sample location was GPS tagged, and each sample was an individual upright or runner with at least 20 leaves of current-year growth.

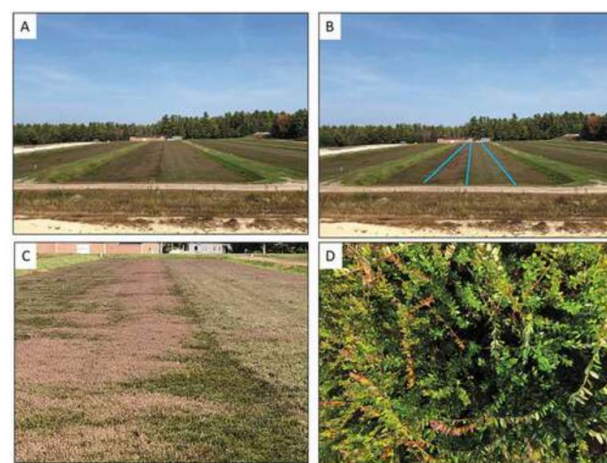


Figure 1. Visual mapping of differences in the cranberry beds at the Wisconsin Cranberry Research Station. A) Example of color (red) and vine height differences, B) mapping of perceived differences (the blue lines indicate areas with perceived differences), C) close-up of color and height differences, and D) example of lack fruit development in the differentially mapped areas

Dr. Zalapa's lab used the Doyle & Doyle (1987) method of 18 steps across 60+ hours to isolate DNA

from the samples. Polymerase Chain Reaction (PCR), a series of thermal cycles, was the next step in preparing the samples for genotyping.

Nine “microsatellite loci” were used as identifiers of the cultivars. A “simple genetic distance matrix” was calculated for each pair of samples, and samples with all 9 alleles identical were considered to be clones.

Of the 288 collected samples, 285 produced usable information. The samples were of 16 total genotypes (Fig 2). Based on planting intention, 261 samples were supposed to be Stevens. In fact, only 180 were—this is 69% genetic purity among the Stevens beds. Based on planting intentions, 24 samples were supposed to be BGs, but only 17 were—this is 71% genetic purity for this bed. The contamination within the BG bed is a closely related BG variant known as BG48.

The most frequent contaminant variety for the expected-Stevens beds was ‘Perry Red,’ which, despite its name, is a non-fruiting cultivar. Six of the 9 Stevens beds contained Perry Red. Other named contaminating varieties were Howes, Potter’s Favorite, and Bugle Mashpee Type.

Nine unknown genotype variants were also identified which could not be matched to accessions in cranberry genetics collections. A Principal Coordinate Analysis (PCoA) was run to determine the likely lineage of these unknown cultivars. Unk4 is closely related to BG and BG48. Unk9 is likely a self of Stevens, Unk5 shares most alleles with Potter’s Favorite, Unk2 is closely related to Howes, and Unk6 shares a large proportion of alleles with Ben Lear and Demoranville (itself a Ben Lear x Franklin). Unknowns 1, 3, 7, and 8 were not able to be identified as similar to known cultivars.

Genetic Fingerprinting at the Wisconsin Cranberry Research Station: Part 2, featuring historical yield analysis, will appear in the Cranberry Crop Management Journal vol. 35 issue 3.

Daniel Matusinec, Andrew Maule, Eric Wiesman, Amaya Atucha, Mura Jyostna Devi & Juan Zalapa (2022) The New Cranberry Wisconsin Research Station: Renovation Priorities of a ‘Stevens’ Cranberry Marsh Based on Visual Mapping, Genetic Testing, and Yield Data, International Journal of Fruit Science, 22:1, 121-132, DOI: 10.1080/15538362.2021.2014016 <https://www.tandfonline.com/doi/full/10.1080/15538362.2021.2014016>

Doyle, J.J., and J.L. Doyle. 1987. A rapid DNA isolation procedure for small quantities of fresh leaf tissue. Phytochemical Bulletin 19:11-15.

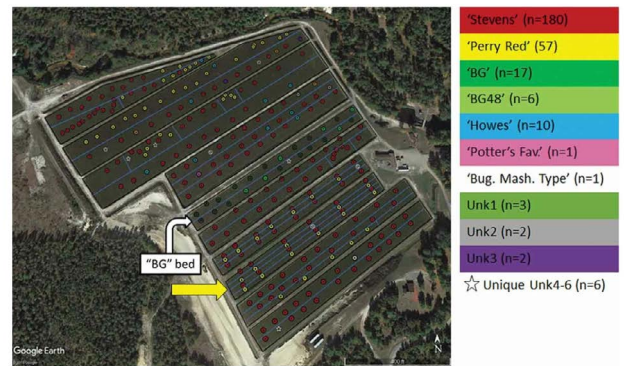


Figure 2. Aerial map of WCRS in 2017, overlaid with the visually identified regions (yellow arrow indicates the bed shown in Figure 1), and points of samples collected, color coded to the cultivar identified by genetic fingerprinting analysis.

Update from the Wisconsin Cranberry Research Station

By Wade Brockman

As the middle of May approaches and our March winds still pounding the region it feels a lot like April yet. The plants are starting to move and turn a little green with the warmer days. All my spring herbicide has been applied and now I am focusing more on the 2 acre genetics bed. The water control structure being rebuilt at the station is coming along great with the hopes of finishing ahead of schedule. And now on to hoping for months of warmer weather and some much needed rain.

Think “Safety First” This Season

By *Jim Versweyveld*

According to the National Institute for Occupational Safety & Health, agriculture ranks among the most hazardous industries. Farmers are at very high risk for fatal and non-fatal injuries, and farming is one of the few industries in which family members (who often share the work and live on the premises) are also at risk for injury and death.

With the hectic pace farms experience during the growing season, you may be looking for easily shared information to keep your workers safe. The UW-Madison Extension Farm Management Topic Hub has free, research-based articles that can help. Transform your marsh’s safety culture with these key resources for your team:

[Effective Farm Safety Training Starts with a Purpose](#)

[Top 10 Farm Safety Tips](#)

[A culture of ‘farm safety’ starts with a well-written policy](#)

[Safe handling of agricultural chemicals](#)

[There’s Opportunity in Those “Close Calls” - Encourage near miss reporting on your farm](#)


[Consider safety before you purchase a used tractor or farm machine](#)

Walk With Care in Cranberry Beds

By *Allison Jonjak*

The Wisconsin Cranberry Research Station hosts tours for the media, public servants, local school groups as well as in-bed research conducted by UW-Madison staff and students. To help visitors protect the plants, themselves, and the cranberry crop during their visits, the Station Manager and the Wisconsin Cranberry Research and Education Foundation requested that I make a printable guide.

The guide is one side of one page, in simple language. It applies to all cranberry marshes, so I wanted to share it widely—if you would like to print copies to use at your own marsh with your own visitors, you can [access the PDF here](#).



Walk With Care in Cranberry Beds

Protect the plants.


Cranberry vines are delicate. Drive or walk on the dike whenever possible. If you are sampling on two ends of the same bed, drive to site 1, walk to take your sample, return to the dike, drive to site 2, walk to take your sample, and return to the dike.

Disturb vines as little as possible. Take large, gentle steps. Cranberry vines are trained by harvest equipment. Never walk against the vines. You may walk with the vines, or at 90 degrees to them. At WCERS, beds 1, 2, 3, and 4 are trained counter-clockwise. All new beds are trained clockwise.

Step Carefully. Step, pick up foot; step, pick up foot. If there is fruit, do not spin your foot—you could knock the berries off or “juice” the berries on the vine. The goal is to not damage the fruit (short term) or the plant (long term).

Don’t spread pathogens. Carry a spray bottle of 20% bleach solution in your vehicle. Spray the sides and bottoms of your boots before you enter a bed, to avoid cross-contamination.

Don’t spread insects or weeds. Check your clothes and pants cuffs for insects or weed seeds. If you are sweeping, use a different net on each marsh.



Protect yourself.

Check for recent applications. When crop protection chemicals have been applied, signs will be posted at the entry to the property.

Verify re-entry intervals. Verify re-entry intervals (REIs) by checking the posting boards (one in station and one in the shop will have the same information). If you must enter a bed before the REI is complete, use the personal protective equipment required by the product’s label.

Protect the crop.

Keep foreign material out of the beds. Properly secure foreign materials (pens, soda cans, etc.) to avoid jams at harvest time. Cigarette butts must not be discarded on the marsh property.

Keep antigens/allergens out of the beds. Foods with human antigen risk (such as nuts) should not commingle with the crop.

Wisconsin Cranberry Research Station, W8510 County Road O, Black River Falls, Wisconsin 54615

Grower Updates

Vilas 51

By Jeremiah Mabie

Spring has officially sprung in the Northwoods! Everyone was very excited to get outside and busy putting in irrigation and spring projects around the farm. The fight with frozen underground this spring was a tough one as just 13 days ago our ice finally went out on the lakes, I still have two lines that are not thawed all the way down the bed! Most if not all growers have started frost watch this past weekend as things are really moving along fast up here. It always amazes me how fast the plants can make up time and be right on track with previous years. We are not renovating here this year but the neighbors just cut and bailed vines for their projects, everyone is also gearing up air booms to apply spring applications. It looks like mother nature wasn't truly ready for summer this week but after that it looks as if things should warm up and we will get some of that much needed beauty rest at night again. Stay safe, stay happy and have a berry good month everyone!

These photos are only 20 days apart!



Flying Dollar Cranberry

By Seth Rice

Hello everybody! Now that we got a few nights of frost watch under our belts and we have the irrigation systems all up and working without the kinks, we can take a short breath. Here we got our early herbicides on, and I hope everybody did as well. Most people that need to plant this year are working hard doing prep work to get the beds leveled and dried out. After that hot spell we had, things are starting to calm down and that's a good thing. We can see baby geese and baby ducks here at Flying Dollar and are looking for our first fawns from the deer. Hope everything goes well, and we will talk next time!

