

Genetic Fingerprinting at the Wisconsin Cranberry Research Station: Part 2

By Juan Zalapa and Allison Jonjak

After the cultivars present in each bed at the newly-dedicated Wisconsin Cranberry Research Station were fingerprinted and named ([see CCMJ 35.2](#)), Dr. Zalapa's lab was able to compare historic yields with the purity of the vines in each bed. They were also able to compare the visual assessment (height, color, and yielding/barren) of cultivar contamination, with the measured genetic contamination.

For yield comparisons, the Stevens beds had yield data available for 2013, 2014, and 2017; while the BG bed was more recently planted and only had 2017 yield data. When viewing the table, remember the beds were numbered 1 to 10, with the first bed being furthest south and bed 10 being the furthest north. Contamination in beds ranged from 0% to 69%, although yield did not track percent contamination as strongly as we had suspected. Figure 1 displays how yield reduces with % contamination—there is a negative trend but it only describes SOME of the yield variation. You can see that some beds did much better than their contamination % would have suggested (ie bed 3), while other beds did more poorly than expected (ie bed 2). Chart 2 lists the raw data for each bed.

In comparing visual determination of cultivar from genetic determination, in general visual detection was able to distinguish Perry Red contaminants from Stevens vines. It appears that the Perry Red contamination was planted in alternating fashion, possibly due to the mowing and baling practice used for planting from genetically untested cuttings.

There were some instances in which the visual examination noticed “differences” which were not there—the researcher thought they were viewing Perry Red, but in fact were seeing Stevens.

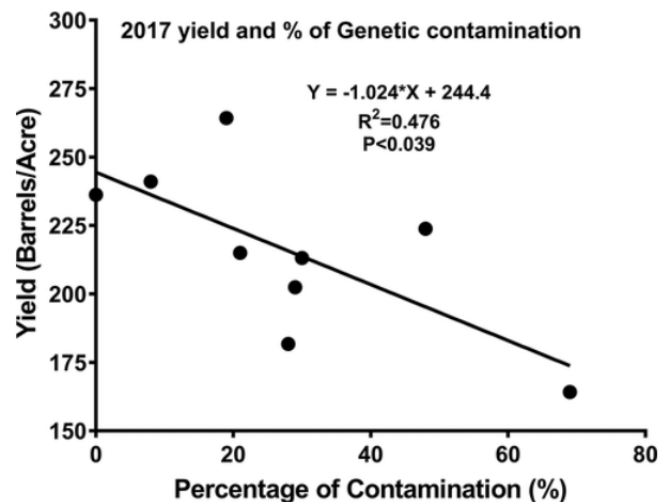


Figure 1. Scatter plot showing a negative correlation ($r^2 = 0.476$, $p < .039$) between 2017 cranberry yield data and percentage genetic contamination, detected using nine microsatellite markers, in the production beds of the WCRS.

Table 2. Genetic contamination (%) per bed at the Wisconsin Cranberry Research Station determined in 2017 using nine microsatellite markers and the yield of each bed in 2013, 2014, and 2017

Bed	(%)	2013 Yield	2014 Yield	2017 Yield	Average Yield
1	8%	216.84	145.26	241.05	201.05
2	21%	231	115.50	215	187.17
3	48%	301.32	180.13	223.84	235.1
4	30%	143.45	210.12	213.1	188.89
5	0%	197.96	110.71	236.22	181.63
6	29%	-	-	202.42	202.42
7	19%	242.82	153.76	264.24	220.27
8	36%	153.86	207.39	287.36	216.20
9	69%	110.39	175.99	164.16	150.18
10	28%	186.43	159.29	181.72	175.81

Smaller pockets of contaminants (ie Howes and Potter's Favorite) were not noticed in the visual inspection.

In the BG bed, no contaminants were noticed visually, as BG48 is very similar to BG. The three unknowns were also not able to be discerned visually.

In all, visual analysis was not perfectly accurate, but it was a useful indicator of genetic contamination, especially for larger blocks of contamination. It is suggested that visual analysis continue to be a guide when choosing samples to fingerprint genetically.

The decision to renovate the beds of the WCRS station in two phases was ultimately governed by location, elevation, water routing as well as yield from 2013-2017 and genetic contamination percent. The work done by Dr. Zalapa's lab to enable this decisionmaking is thoroughly appreciated by the WCRS board of directors, and by all growers who benefit from research undertaken at the research station.

Genetic Fingerprinting at the Wisconsin Cranberry Research Station: Part 1, featuring cultivars found in existing WCRS beds, appears in the [Cranberry Crop Management Journal vol. 35 issue 2](#).

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://doi.org/10.1080/15538362.2021.2014016)
<https://www.tandfonline.com/doi/full/10.1080/15538362.2021.2014016>

Vegetative Side Shoots

By Amaya Atucha and Allison Jonjak

Following spring hailstorms, many growers throughout Wisconsin are observing vegetative side-shoots on uprights. In many cases the uprights that exhibit later shoots also have an apical bud that is very delayed in development, and it is not clear whether that apical bud will pull through and bloom. Scouting beds will be critical to estimate the percentage of uprights with apical buds either damaged or not developing. If there is a significant amount of damage to apical buds, which will result in yield reduction, and in addition there is a lot of side shoots, then fertilizer application will have to be reduced as well. If growers do not adjust fertilizer application, then those side shoots will grow vigorously and will not set flowers for the spring of 2023. The only tool we have to control the growth of those lateral shoots is to reduce fertilizer application.



Photo credit: Wade Brockman- Wisconsin Cranberry Research Station

Identifying vegetative side-shoots

Vegetative side-shoots are your cranberry plant's response to a damaged apical meristem. The meristem may be damaged in a variety of ways (spring hail, tipworm damage, etc), but no matter what the cause, the plant responds by producing new shoots from dormant vegetative buds located immediately below the apical bud.

Managing vegetative side-shoots

Vegetative side shoots should be thought of both for their impact on the current season's crop, and on the following season's crop.

Current season: If the apical meristem was damaged but not killed, the vegetative side shoots will be competing with the fruit for nutrition. This can result in fewer or smaller fruit. If the apical meristem was killed, there will be no fruit for the vegetative side-shoots to compete with, but this means your vegetative side shoots will be even more likely to overgrow.

Next season: This is the main arena where your management will have an impact. Vegetative shoots have a tendency to overgrow, especially when they receive ample nutrition. Because fruit demands nutrients, uprights with fruit necessarily "end" vegetative growth to direct nutrients to the fruit, and this allows next year's bud to form. When there is not fruit limiting the nutrients the vegetative shoot can receive, it can continue to grow, and fail to set next year's bud.

To prevent your vegetative side shoots from overgrowing, reduce the fertilizer you had planned to supply. On a bed-by-bed basis, check the % of uprights showing vegetative side-shoots. If you have a bed with 10% of uprights with side-shoots, reduce your fertilizer (N and P and K) by 10%. If 50% of uprights are showing vegetative side-shoots, reduce your fertilizer by 50%. Check each bed and make each bed's fertilizer rate decision based on conditions you see when scouting. Use what you see, and adjust this advice if you see

signs of deficiency, or reduce your fertilizer further if you are still seeing overgrowth.

After blossom will be a critical period for managing your vegetative side-shoots to prevent yield reductions for 2023, so please reach out with any questions you have.



Vegetative side shoots, photographed on May 24, in a bed that received hail

Update from the Wisconsin Cranberry Research Station

By Wade Brockman

Well it's been a cold last couple of weeks with not a lot of plant movement. What a difference from last year when I was finding blossom's about this time and this year just pushing hooks. Still waiting patiently for a warm summer to start. This stretch of weather has given me a lot of time to prepare for the summer field days in August.



Leafhoppers Are Starting To Show Up

By *Christelle Guédot*

In the last couple of weeks, we have detected, at several marshes, the presence of very small leafhopper nymphs that are most likely blunt nosed leafhoppers (BNLH). While the presence of BNLH is still sporadic in WI, with the vast majority of marshes not having BNLH present, it is strongly recommended to monitor by sweeping beds from mid-May to mid-June to ensure that BNLH is not establishing on your marsh. BNLH being the only known vector of the cranberry false blossom disease phytoplasma, it is important to monitor for their presence. A handful of marshes in 2020 and 2021 have also experienced high densities of leafhoppers (100-200 per sweep set) and such densities can cause feeding damage and drain the water and sugar from vines.



Leafhopper nymph. Photo by Dave Jones, Ocean Spray Cranberry and Pam Verhulst, Lady Bug IPM

- In young beds, new varieties, and/or beds with known false blossom disease incidence, it is recommended to apply an insecticide when reaching 20 BNLH nymphs per sweep set.
- In older beds, older varieties, and beds with no incidence of false blossom, this threshold can be increased to 40 BNLH nymphs per sweep set.
- If you have a history of leafhopper feeding damage, the threshold would likely need to be lowered this year to about 20-30 leafhoppers per sweep set.

If you reach any of these thresholds **prebloom**, several insecticides provide good control against BNLH nymphs and these include the broad spectrum organophosphates (e.g., Orthene, Imidan, Diazinon), carbamates (e.g., Sevin), or pyrethroids (e.g., Danitol, Fanfare). Regarding Fanfare, please refer to this [previous article](#) regarding use patterns. Neonicotinoids are also efficacious against leafhopper nymphs but are not recommended prebloom as the active ingredients can be found in flowers and affect pollinators. For organic growers, while we did not assess organically-approved insecticides against leafhoppers yet, ***Pyganic is likely to be the most effective pre-bloom.***

If you find high numbers of BNLH adults **postbloom** (>40 per sweep set), you may consider a postbloom application after mid-July with either an organophosphate (see above) or a neonicotinoid (Actara or Venom), depending on the timing and PHIs. ***Pyganic will likely remain your best option for organic production.***

As always, read the labels and follow all label instructions and check with your handlers before using any chemical products.

Happy growing season!

Wisconsin Fungicide Update 2022

By Leslie Holland

This article provides some recent updates on fungicides currently registered for fungal disease control in cranberry. Specific usage instructions such as rates, timing, and precautions can be found on the fungicide labels, the 2022 Cranberry Pesticide Chart from the Cranberry Institute, and the 2022 Wisconsin Cranberry Pest Management Guide. Please make sure you have the most up-to-date versions of these documents and get rid of older versions. If you notice an inconsistency between the product label and the UW spray guide or Cranberry Institute chart, always follow the instructions on the label. Check with your handler about rule changes and restrictions. REMEMBER, the label is the law, read and follow the directions on the label.

What is FRAC?

The Fungicide Resistance Action Committee or FRAC works to prolong the effectiveness of fungicides prone to resistance issues and minimize crop losses in the event of resistance. A FRAC group is a number and/or letter combination used to distinguish different fungicides based on their mode of action.

Mancozeb (FRAC M3) - In cranberry, mancozeb offers broad-spectrum control against fruit rot pathogens, however mancozeb can result in reduced fruit color if applied during bloom and/or fruit set stages, critical application timing for fruit rot control. As of January 4, 2021, mancozeb is no longer approved as an active substance at the European Union (EU) level. Mancozeb will soon be undergoing a registration review by the US EPA. A public comment period has not yet been defined. As more updates become available, I will share them here in the Cranberry Crop Management Journal.

Chlorothalonil (FRAC M5) is currently undergoing registration review by the EPA. In Wisconsin, this chemistry is not widely used due to the large proportion of harvested fruits that are destined for export markets where residues are not tolerated. However, fruits for domestic consumption may still utilize chlorothalonil for fruit rot control in accordance with handler rules and the fungicide label. For decades, chlorothalonil has been an important tool for fungicide resistance management due to its multi-site activity. This chemistry is a critical tool for fruit rot control in the northeast where disease pressure is significantly higher. In Wisconsin, chlorothalonil remains the only broad-spectrum fungicide used to treat upright dieback. Currently, there are no new updates on the registration review process, but I anticipate learning more by late 2022.

Tank Mixes vs. Pre-mixes

As many navigate fruit rot management this season and the increased costs of pesticides, there may be interest in using the most affordable products available. Fortunately, in Wisconsin, we've seen excellent fruit rot control with our registered single-site and premixed chemistries in FRAC groups 3 and 11. The tank mix of Indar + Abound has been the grower standard for many years but with the addition of pre-mixture chemistries to the cranberry fruit rot management toolbox, I want to highlight some important differences between these current fungicide offerings as growers prepare themselves for their first in-bloom spray application.

Tank mixing = two or more chemical pesticides mixed in a spray tank prior to spraying.

Pre-mixture = product that contains two or more active ingredients.

- Indar + Abound is a common and highly effective **tank mix** for fruit rot control in Wisconsin. Indar is a member of the FRAC 3 group of fungicides and contains the active ingredient fenbuconazole. Abound is a member of the FRAC 11 group of fungicides and contains the active ingredient azoxystrobin. This tank mix combination is often considered a grower standard in Wisconsin and has performed consistently in Wisconsin fungicide trials in low and high disease pressure years.
- Quadris Top is a **pre-mixed** fungicide also shown to be very effective against fruit rot and cottonball.

This premixture includes active ingredients azoxystrobin (FRAC 11) and difenoconazole (FRAC 3). This fungicide is growing in popularity due to the convenience of the active ingredients being combined in the product.

- **NOTE:** While Indar + Abound and Quadris Top include active ingredients in the same FRAC groups, they are not identical products. ***Specifically, Quadris Top is not Indar and Abound mixed together.*** While Indar + Abound and Quadris Top both contain the same FRAC 11 fungicide, azoxystrobin, the rate of azoxystrobin is different in Abound than in Quadris Top. Furthermore, Indar contains the active ingredient fenbuconazole, while the FRAC 3 component of Quadris Top contains difenoconazole. Fenbuconazole and difenoconazole are different chemistries but have the same mode of action.
- Quilt Xcel is also a **pre-mixed** fungicide, and while it is registered for both cottonball and fruit rot control, it should only be used for cottonball control as it recommends applications at early bloom rather than later as is generally needed for good fruit rot control. Similar to the fungicides listed above the active ingredients in Quilt Xcel include fungicide chemistries in FRAC groups 3 and 11. The FRAC 11 chemistry is azoxystrobin and the FRAC 3 chemistry is propiconazole (different than the active ingredient in Indar and the FRAC 3 chemistry in Quadris Top).

There are benefits to tank mixing fungicides, and there are benefits to premixes. The choice is yours, and there is no wrong answer as it depends on your operation. I offer some general considerations below.

	Tank Mixes	Pre-mixtures
PROS	<ul style="list-style-type: none"> • May reduce costs depending on price of individual ingredients • Fungicide resistance management by mixing different active ingredients • Customize mix of chemicals to fit your needs • Can adjust rates of each chemistry in tank mix 	<ul style="list-style-type: none"> • May reduce costs depending on price of pre-mixed product • Fungicide resistance management as product contains different active ingredients • Less handling than mixing individual active ingredients • Less inventory required (i.e., only one container)
CONS	<ul style="list-style-type: none"> • May increase costs depending on price of individual ingredients • More handling compared to pre-mixed chemistries • Requires understanding of chemicals and their interactions • Requires more inventory 	<ul style="list-style-type: none"> • May increase costs depending on price of pre-mixed product • Recommended application timing may not be optimal for all ingredients • One of the chemistries may have a reduced rate • Cannot adjust rates of each chemistry

******The mention of a product is not an endorsement. The label is the law. Check handler guidelines for additional rules and regulations.***

Grower Updates

Vilas 51

By Jeremiah Mabie

Welp, she's been a chilly start to the growing season! Between running long nights of frost, rain days and the gosh darn hurricane force winds we have had our fair share of challenges up north so far. There's even been rumors of breaking out the long johns again! All jokes aside the vines have really slowed down the past couple weeks, but with great progress in the last week as temps are finally getting into the 70's again.



With most if not all spring herbicides on, growers have been busy working on beds to plant, pulling weeds, road work, ditching and all those other pesky jobs that are always on the to-do list. With the cold temperatures bug pressure has not been an issue yet. Even though it seems like we are on the movie Groundhog Day trying to get out of this rut of a spring we have been in, it won't be long and the bees will be here and working hard! Have a wonderful June everyone!



Flying Dollar Cranberry

By Seth Rice

Well we have had our first couple of applications with the boom already. It's hard to find some dry weather between all these rain days but it can be done! Planting has already started in most marshes but some are still waiting for some better weather to finish. We're seeing a lot of swelling on the plants, especially on the hybrids. Soon the bees will be here before we know it. Happy growing season everyone!