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This publication was compiled and edited by:

Christelle Guédot
Fruit Crop Entomology and Extension Specialist
Department of Entomology
University of Wisconsin-Madison

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Table of Contents

EVALUATING THE ROLE OF EXTERNAL INOCULUM IN THE CRANBERRY FRUIT ROT DISEASE COMPLEX

LESLIE HOLLAND and EVAN LOZANO

Department of Plant Pathology, University of Wisconsin-Madison, WI

Cranberry fruit rot (CFR) is a sporadic disease of cranberry marshes in Wisconsin. Most fruit rot infections occur during the bloom period; however, the timing of fungal inoculum dispersal and depletion events, and source of this inoculum is not well-defined. Further, the fruit rot fungal species actively spreading during this period is not clear, especially as it relates to the pathogens already present in cranberry tissues as latent infections.

Preliminary investigations into fungal dispersal at bloom

In our 2021 study we investigated the role of external inoculum during the bloom period in a central Wisconsin marsh. Six to 8 spore traps (Figure 1) were deployed in beds of four different varieties. Beds were not sprayed for fruit rot during bloom. Spore trap collections were made every four days from mid to late June during the rapid progression of bloom. Spores collected in the traps were brought back to the laboratory for fungal isolation and identification using standard culturing methods and a molecular diagnostic protocol. These pilot studies revealed the presence of spores representing several fruit rot pathogens and a known fungal pathogen of pine trees. Results of this work will support future testing of refined management approaches (ex. fungicide sprays) based on our knowledge of epidemiological factors.

Fig. 1: Spore trap deployed in a cranberry bed during bloom.

Examining latent infections in cranberry plant tissues

To determine the fungal pathogens associated with latent infections in vines, we sampled uprights and runners every 1 to 3 weeks from May to September in 2021 at the Cranberry Research Station. All plant organs (uprights, runners, leaves, flowers, fruits) were subjected to fungal isolation procedures and molecular testing is ongoing. Early findings suggest that the bitter rot fungus, *Colletotrichum*, was detected in fruit and leaf tissues only, and did not show up in our culturing assays until July. *Colletotrichum* continued to be a dominant fungus in these tissues during collections made in August. One of the fungi associated with black rot, *Allantophomopsis*, was detected from all plant organs throughout the sampling period. *Phomopsis* (viscid rot) was detected in June sample collections but not later in the season.

Cranberry fruit rot fungi in rotted berries

During harvest we processed over 1,200 rotted fruits from over 60 beds representing numerous varieties and locations in central Wisconsin. Our preliminary analysis of the rotted fruits suggests several fruit rot pathogens are dominant in these beds (Table 1). Bitter rot

(*Colletotrichum* spp.) and ripe rot (*Coleophoma empetri*) are the most frequently isolated fruit rot fungi at harvest. This is consistent with our data from 2020.

Table 1: Percent incidence of CFR fungi isolated from rotted fruits at harvest.

Fungi	% incidence (in rotted fruits)
Coleophoma empetri	31
Colletotrichum spp.	28
Phomopsis vaccinii	13
Phyllosticta vaccinii	6
Sterile (no fungi)	5
Other fungal species	17

Future studies

During the 2022 growing season, we plan to investigate the role that water (rain in spore traps and reservoir water used for irrigation) may play in cranberry fruit rot infections. Understanding dispersal patterns of fruit rot fungi during bloom will allow us to identify periods of fungal spore spread and this knowledge will help us improve our fungicide management strategies. This work will also provide insight into the dominant fungal species infecting during bloom. The aims of this project are to 1) study the patterns of spore dispersal during bloom, 2) assess the fungal species associated with latent infections in flowers, and 3) monitor fruit rot fungal species composition over the years.

Acknowledgements

We thank our grower collaborators, Wade Brockman at the WI Cranberry Research Station, and Emma Nelson, Emma Mechelke, and Drew Benish for their assistance in the field and the lab!

CRANBERRY FRUIT QUALITY GENETIC RESEARCH AND THE VACCAP PROJECT: DISTINGUISHING SOFT AND FIRM BERRIES

MATTHEW PHILLIPS[A], HECTOR LOPEZ-MORENO[A], LUIS DIAZ-GARCIA[B], EDWARD GRYGLESKI[C], LARA GIONGO[D], AMAYA ATUCHA[A], MASSIMO IORIZZO[E], AND JUAN ZALAPA[A,F]

[a]Department of Horticulture, University of Wisconsin-Madison; [b]Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias, Aguascalientes, Mexico; [c]Valley Corporation, Tomah, WI; [d]Genomics and Biology of Fruit Crop Department, Fondazione Edmund Mach, Italy; [e]Plants for Human Health Institute, North Carolina State University; [f]USDA ARS, Vegetable Crops Research Unit, WI

Fruit texture is a particularly important fruit quality parameter for the cranberry industry to processes sweetened dried cranberries (SDCs). Therefore, to help with the creation of cranberry cultivars with high-quality fruit, we investigated several firmness analysis methods for cranberry. Our goal was to define the best test conditions for measuring firmness in cranberry since there is currently almost no scientific literature on this topic. We conducted five tests: a single compression test (50% strain), double compression test, puncture test, cutting test, and Kramer shear cell test. We tested 100 fruit from each of 10 cultivars known to vary in firmness from low to high, and observed how each of the five test ranked the cultivars and detected differences in firmness between the cultivars. The double compression test was the best test in terms of ranking cultivars according to their known firmness. To a lesser degree, the puncture test also differentiated the cultivars, while all of the other tests were unable to differentiate cultivars by firmness. Several strains (5-40%) and speeds (1-15mm second) where tested for the double compression test to find the combination which gave the more accurate results. Slow speeds of 2mm per second and strains between 10% and 20% were best to differentiate cultivars by firmness. To determine the sample size required to reduce error in our analysis, we conducted a double compression analysis on 'Stevens' using 300 fruit and used permutation tests to determine how sample size effects the variance of our measurements. Additionally, we collected measurements for external appearance (color and size), internal structure (locule size and flesh area), and firmness traits of each individual berry for 100 fruit from each of the 10 cultivars, which allowed us to see how these fruit quality traits are related. This information will be useful for the selection of cranberries with the best traits for SDC production and in the future will lead to the development of marker-assisted breeding strategies for fruit quality in cranberry through the effort of the VacCap project.

OCCURRENCE OF BLUNT-NOSED LEAFHOPPER AND FALSE BLOSSOM IN WISCONSIN MARSHES

CHRISTELLE GUÉDOT[1], LESLIE HOLLAND[2] and CASEY TRICKLE[1,2]

[1]Department of Entomology, University of Wisconsin-Madison, WI
[2]Department of Plant Pathology, University of Wisconsin-Madison, WI

Cranberry false blossom disease (CBFB) was a devastating disease of cranberry in the early 1900s. It spread from diseased vines in Wisconsin to other cranberry producing regions in the United State and Canada. It occurs naturally in both the large American cranberry (*Vaccinium macrocarpon*) and the small cranberry (*V. oxycoccos*). False blossom is transmitted by the blunt-nosed leafhopper (BNLH; *Limotettix vaccinii*). Infected vines do not recover from false blossom, and they do not bear fruit. Symptom of false blossom can develop 1-month to 1-year after infection, making early detection difficult.

The objectives of our research are to 1) assess seasonal phenology of BNLH in Wisconsin cranberry marshes, 2) determine location within beds of BNLH, 3) determine leafhopper species composition, and 4) assess distribution of the CBFB phytoplasma in Wisconsin marshes.

The leafhopper part of this study (Objectives 1-3) was conducted from mid-May through end of August 2021 by sampling weekly with a sweep net over two 20m long transect lines within each bed, 1m in from the edge of the bed and 1m off the center irrigation line. Collection started at three properties with up to five beds each. Three additional sites were added in mid-June upon reports of BNLH presence. Additionally (Objective 4), we confirmed the identity of the cranberry false blossom phytoplasma in four commercial beds and detected DNA of the phytoplasma in all plant organs on symptomatic uprights.

Seasonal phenology and location within beds of BNLH

In 2021, we documented the seasonal phenology of BNLH in WI cranberry (Figure 1), with the first occurrence on our first week of sampling on May 17, and the last capture of BNLH occurring on August 9. This suggests that BNLH were likely present before we started sweep sampling and we plan to start in early April in 2022 to insure we detect the first BNLH of the season. We separated immatures (nymphs) from adults and while the nymphs were not positively confirmed to be BNLH, we suspect that they were mostly BNLH from the number we collected and number of adults following the nymph stage (Figure 2). We will be able to document the nymph presence more accurately in 2022 as we will work with marsh managers that do not anticipate spraying for leafhoppers next season. This first year of data suggests that there is indeed only one generation of BNLH that starts with nymphs from overwintering eggs, and that adult populations peak in early to mid-July, lay eggs, and die out by early August.

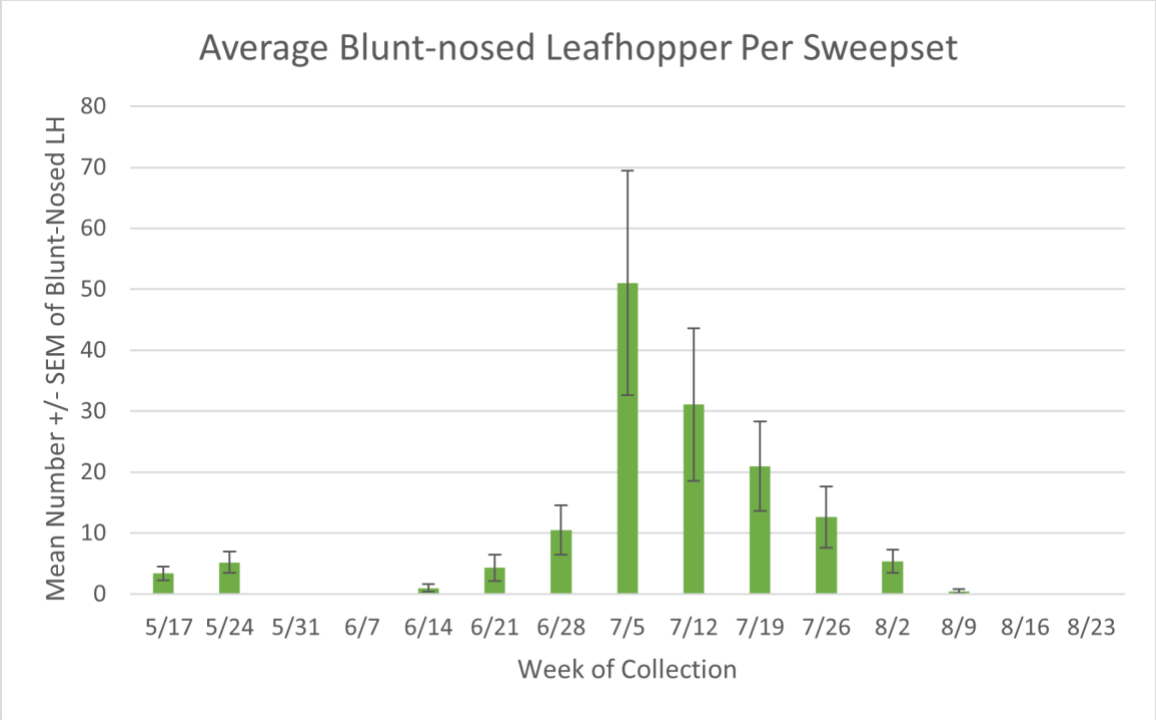


Figure 1. Seasonal phenology of BNLH in WI in 2021.

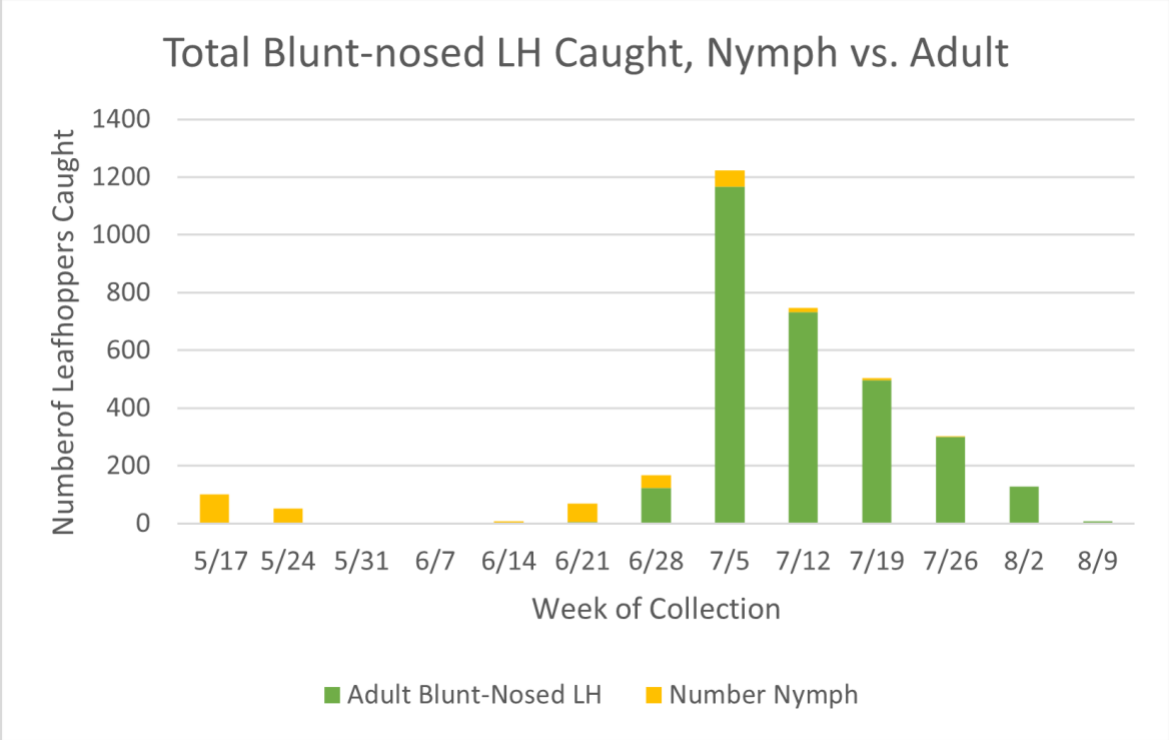


Figure 2. Seasonal phenology of BNLH in WI in 2021, separating nymphs (suspected to be BNLH) from adults.

We sampled weekly 1m from edge of bed and 1m off center irrigation line to determine if there was an edge effect, suggesting that BNLH would be moving into beds from outside beds, leading to more BNLH near the edges of the beds. Our results suggest that BNLH are likely randomly distributed across beds with no apparent edge effect (Figure 3). This makes sense considering they likely overwinter as eggs within cranberry beds.

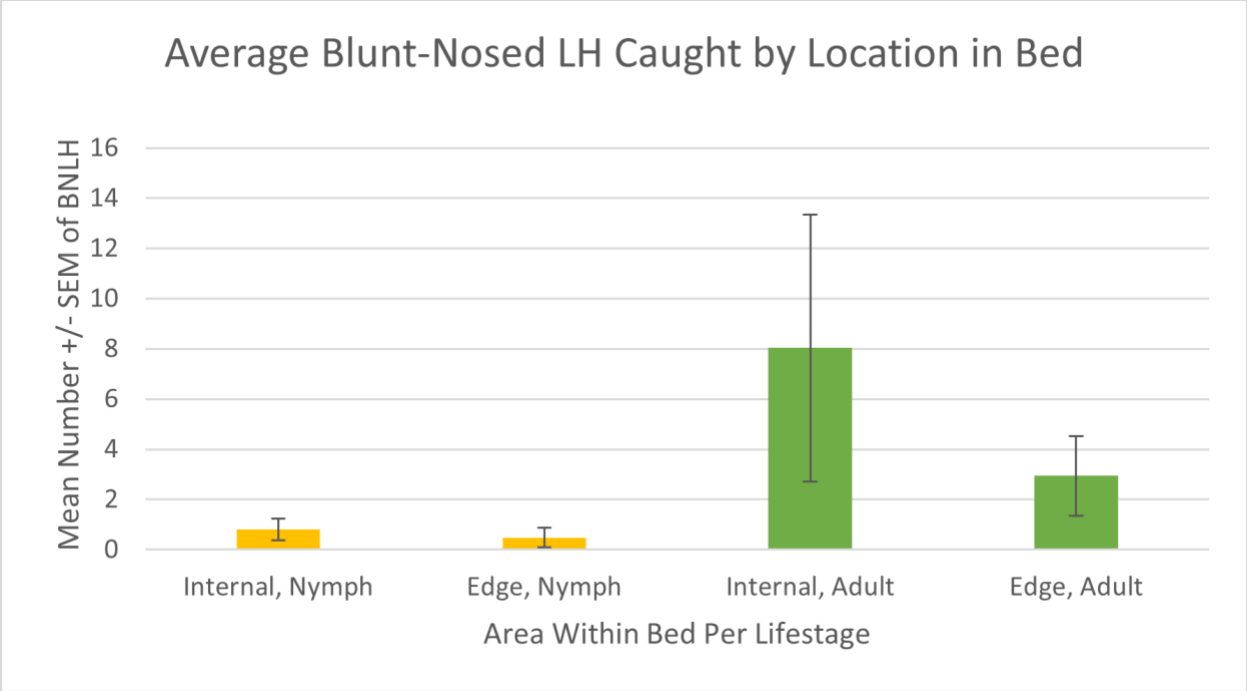


Figure 3. Distribution of BNLH between edge and center (internal) of the beds for nymphs and adults.

Seasonal phenology of other LH species

In this study, we also wanted to determine what other species of leafhopper may be present in cranberry. We found possibly 7 other species (morphospecies at this time that still need to be identified to species) of leafhoppers in sweep samples, including potato leafhopper and sharp-nosed leafhopper. Overall, BNLH dominated the bulk of the leafhoppers (80%) found in WI cranberry (Figure 4).

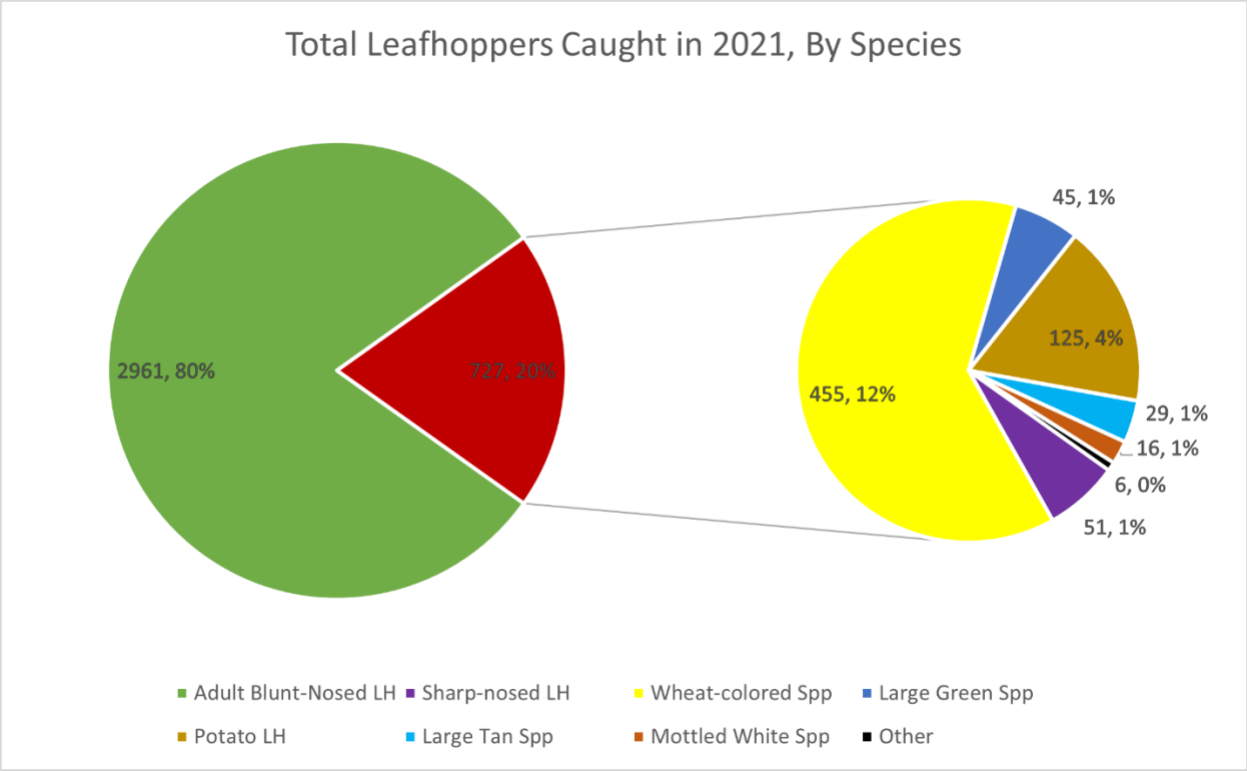


Figure 4. Species composition of leafhoppers collected in sweep samples in WI cranberry in 2021.

Leafhoppers were found over the entire sampling period in small numbers (<5 LH/sweepset/week) from mid-May to the third week of August (Figure 5), though again, BNLH adults were predominant from June 28 to August 2 in 2021. Our results suggest that BNLH are well established in beds where they have been detected, reaching an average number of 50 adults per sweep set at their peak in the first week of July and are the predominant leafhopper species at the locations we sampled from.

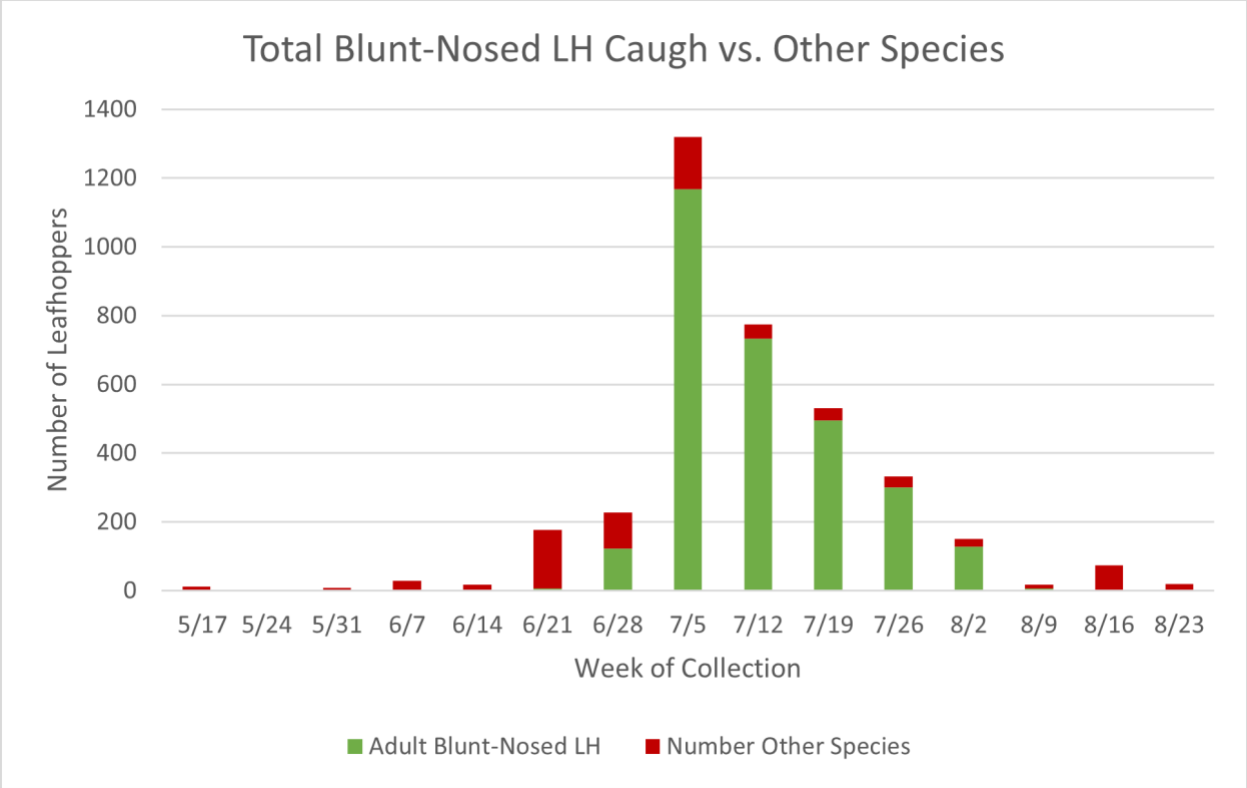


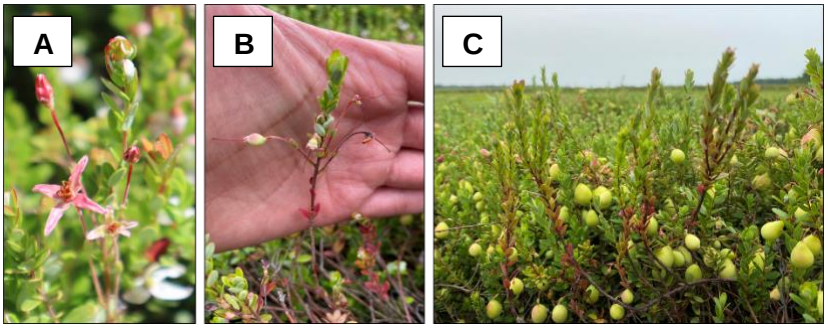
Figure 5. Seasonal phenology of adult leafhoppers vs. BNLH.

False blossom distribution and detection

Vines displaying symptoms of false blossom were identified in 4 cranberry beds during the 2021 growing season. Beds were in Jackson and Wood counties, and symptomatic varieties were identified as 'Stevens' and 'Haines'. Despite recent concern over this disease, we did not receive reports of any other symptomatic vines. It is possible that the distribution of this disease is over or underestimated. Further misdiagnosis of symptoms is also possible. Additionally, insecticides were used to decrease leafhoppers incidence, and this may have contributed to lesser disease incidence in 2021.

Symptoms of false blossom were most apparent during bloom due to the distorted floral parts. Plants infected with false blossom can display dark pink flower petals or petals with red streaking (Figure 1A). The pedicels are erect rather than arched. Stamens and pistils are irregular, and result in sterile flowers (Figure 1B). Berries either abort or are small and misshapen. Branches are closely spaced, and leaves are folded close to the stem, creating a witches' broom effect. Infected vines may extend above the canopy and turn red prematurely in the fall (Figure 1C). Enlarged terminal buds are prone to winter injury.

The selection of field sites for false blossom symptom observations and sample collections were based on the following criteria: 1) beds with CBFB symptoms + neighboring beds, 2) sites where leafhoppers were caught during sweep sets, 3) sites were leafhopper feeding damage was observed, and 4) sites where reports were made on observations of CBFB symptoms.



In these beds we observed that symptomatic uprights were found in small patches or hot spots within the bed, but otherwise lacked any distinct pattern within the bed. Symptoms were most obvious during bloom. Symptoms were not easily observed from the dike, and in-bed observations were critical to accurately assess the presence of false blossom symptoms. Neil E. Stevens, Senior Pathologist with the USDA (1931) said it best when he described observing the false blossom disease when it first appeared Wisconsin marshes "Usually it is necessary ***to hunt*** in order to find a plant with false blossom…" DNA extraction of the CBFB phytoplasma from plant tissues was successful, however, DNA of the phytoplasma could not be detected from BNLH nymph or adults. The PCR tests used to confirm the identity of the CBFB phytoplasma was sensitive and able to detect the phytoplasma in symptomatic upright tissues (leaves, stems, flowers, roots). The PCR's ability to detect the CBFB phytoplasma confirmed its presence in several WI beds.

Next steps

Spatiotemporal dynamics of cranberry false blossom

- Determine bacterial titer in different plant organs
- Evaluate disease progression (bacterial titer) throughout season
- Detect asymptomatic infections
- Long-term: Assess CBFB incidence on other varieties

Seasonal phenology of LH and feeding assays with BNLH

- Seasonal phenology starting in April
- Determine life stage and density leading to feeding injury

BNLH is only known vector thus far with one generation per year. Lorsban provided great control of nymphs, resulting in no adults collected thereafter, but Lorsban is no longer allowed on fruit crops. It is important to think about alternative insecticides for pre-bloom applications to target BNLH nymphs and alternatives are listed in the Cranberry Pest Management in Wisconsin Guide.

Recommendations

- Thorough scouting programs in beds in May/early June
- Base sprays on sweep set numbers not necessarily history, especially if you applied Lorsban in 2021.
- Contact us if you observe cranberry false blossom symptoms and/or leafhopper activity at your marsh.

We thank the Wisconsin Cranberry Board and Cranberry Institute for their funding and support. We thank our grower collaborators and lab assistant Emma Nelson for their contributions to this project.

POLLINATION PRACTICES AND PERCEPTIONS AMONG WISCONSIN AND QUEBEC CRANBERRY GROWERS

NOLAN AMON[1], MONICA QUEZADA[1], DIDIER LABARRE[2], and CHRISTELLE GUÉDOT[1]

[1]Department of Entomology, University of Wisconsin-Madison, WI

[2]APCQ

Cranberries are highly dependent on insect pollination, and most growers rely on rented colonies of managed honey bees to insure their needs for pollination are met. However, concerns surrounding the reliance on managed honey bees for pollination services have arisen due to factors including widespread pathogens and parasites within populations of managed honey bees, and colony collapse disorder. Managed bumble bees are commercially available and highly efficient at pollinating many crops, including cranberries, yet utilization of commercial bumble bees has remained relatively low in North America. In this study, we surveyed cranberry growers from Wisconsin and Quebec (QC) to assess their current crop pollination practices and attitudes regarding managed bumble bees as potential crop pollinators on their marshes. We inquired about their farm demographics, usage of several pollination practices, factors influencing their pollination practices, sources of information on crop pollination, and perceptions of managed bumble bees.

We provided growers with a survey of 20 questions grouped into three sections, corresponding to the objectives of our study: (1) comparing grower and farm characteristics between WI and QC; (2) understanding current pollination practices, factors informing these practices, and how growers acquire information about pollination; and (3) assessing grower perceptions of managed bumble bees for cranberry pollination. Surveys were created using the online platform Qualtrics, and approved by the UW-Madison Institutional Review Board (IRB). The survey was then translated into French for Quebec growers. Surveys were then distributed to Wisconsin growers using the Virtual Marsh listserv and to Quebec growers through an email list maintained by the Quebec Cranberry Grower's Association. Responses to some questions were pooled to facilitate easier comparison (i.e. "agree" or "strongly agree" collapsed into a single category).

Our survey reached roughly a quarter of all cranberry growers in either region, based on figures obtained from federal agricultural censuses in the United States and Canada (24% WI, 27% QC). According to our survey, growers in Wisconsin have been managing their acreages longer than Quebec growers, and keep managed bees on their farms for longer than Quebec growers. Quebec growers manage larger marshes than Wisconsin growers and pay more for commercial pollinators than Wisconsin growers. Wisconsin and Quebec growers have approximately the same stocking densities of managed honey and bumble bees on their marshes, attain similar yields at harvest, and set colonies out on their marshes at approximately the same percent bloom (Table 1).

	N responding		Mean ± SE	
Grower and farm characteristics	**WI**	**QC**	**WI**	**QC**
Years growing cranberries	53	21	28.85 ± 2.08	18.76 ± 1.85
Acres managed	47	21	186.32 ± 52.80	302.14 ± 84.02
Number of honey bee hives per acre	50	22	2.88. ± 0.17	2.27 ± 0.61
Cost per HB hive (USD)	42	22	76.05 ± 1.53	111.38 ± 1.52
Number of bumble bee colonies per acre	17	8	1.35 ± 0.21	1.24 ± 0.40
Cost per BB quad (USD)	15	8	69.43 ± 1.66	78.5 ± 8.68
Barrels (100 lbs) / acre produced	53	22	293.84 ± 12.41	274.28 ± 15.04
Percent bloom when colonies set out	50	22	11.94 ± 1.22	14.09 ± 2.04
Days colonies are on the farm	54	22	30.67 ± 1.70	20.32 ± 1.75

Table 1. WI and QC cranberry grower and farm characteristics

Pollination practices between growers in these two regions are largely similar (Fig. 1), with the majority of growers in both regions renting honey bees for cranberry pollination. Approximately 30-40% of growers in both regions also utilize managed bumble bees for pollination. No growers in either region reported doing nothing for pollination, which would entail relying exclusively on the wild bee fauna around their marshes for crop pollination. One notable difference between WI and QC growers was the planting of supplemental pollinator gardens on their marshes, with more than 90% of QC growers and around half of WI growers reporting this practice. Cost share programs by the Canadian government may facilitate greater adoption of this practice in QC, though we did not inquire as to the rationale behind the planting of these gardens.

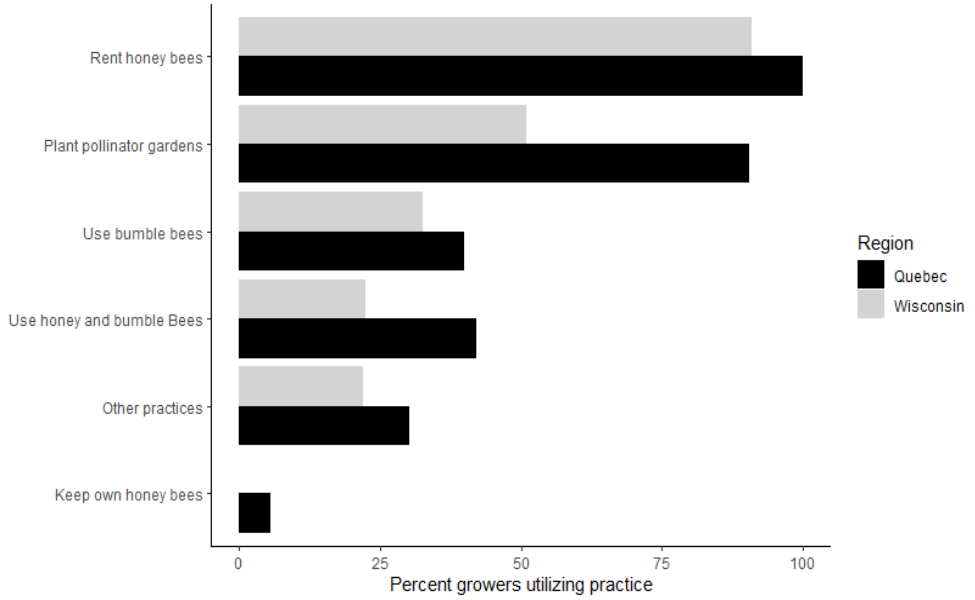


Figure 1. Summary of pollination practices reported by cranberry growers in WI and QC.

When we inquired about the factors that influenced growers' pollination practices, we found that maximizing fruit yield was the most important consideration for growers in either region. Important secondary considerations for WI growers were improving fruit quality and minimizing risk. QC growers were also concerned with minimizing risk, but also keeping up relationships with their beekeepers (Fig. 2). Sources of pollination information were also largely the same between these two regions, with beekeepers, university specialists, and crop consultants ranking as the top three sources of information in either region (Fig 3), though the order was different based on region, with beekeepers being most important in QC and university specialists being considered most important in WI. It is interesting that university specialists factor so highly in QC growers' perceptions, as Canada lacks the extension system that is present in the United States and facilitates communication between university specialists and growers.

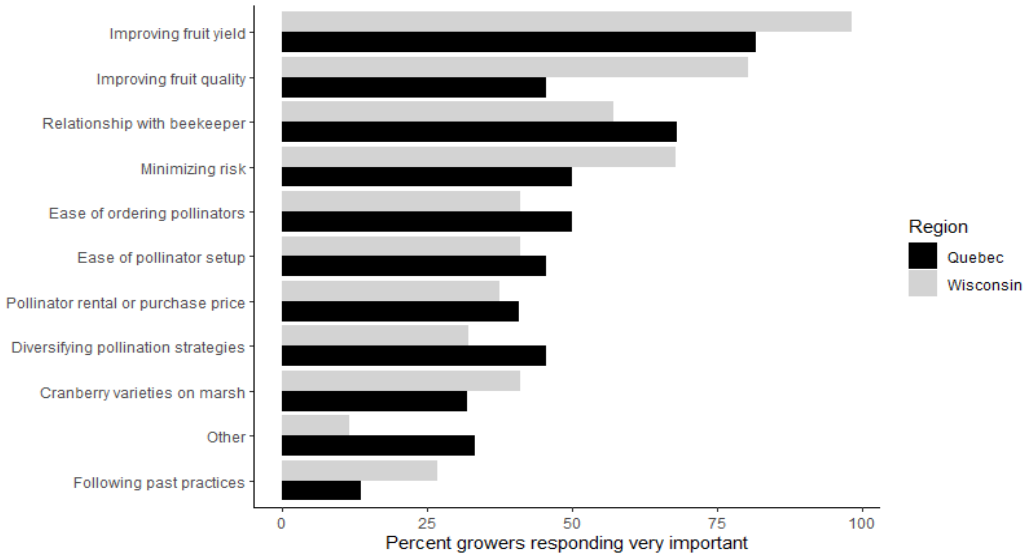


Figure 2. Summary of considerations informing pollination practices of WI and QC cranberry growers.

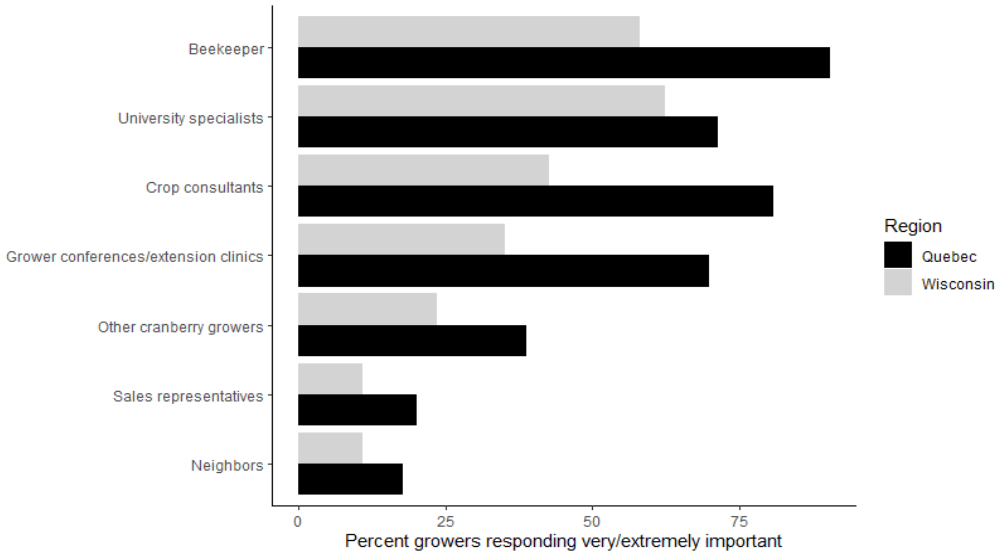


Figure 3. Sources of pollination information for cranberry growers in WI and QC.

Growers in WI and QC share the same perceptions regarding the greatest benefit (Fig. 4) and challenge (Fig. 5) of using managed bumblebees as alternative pollinators. The greatest benefit perceived is that bumble bees are better able to pollinate in inclement weather than honey bees, a particularly useful trait in the often rainy summers of WI and QC. Conversely, the price of bumble bee colonies in WI and QC was considered the largest barrier to their widespread adoption.

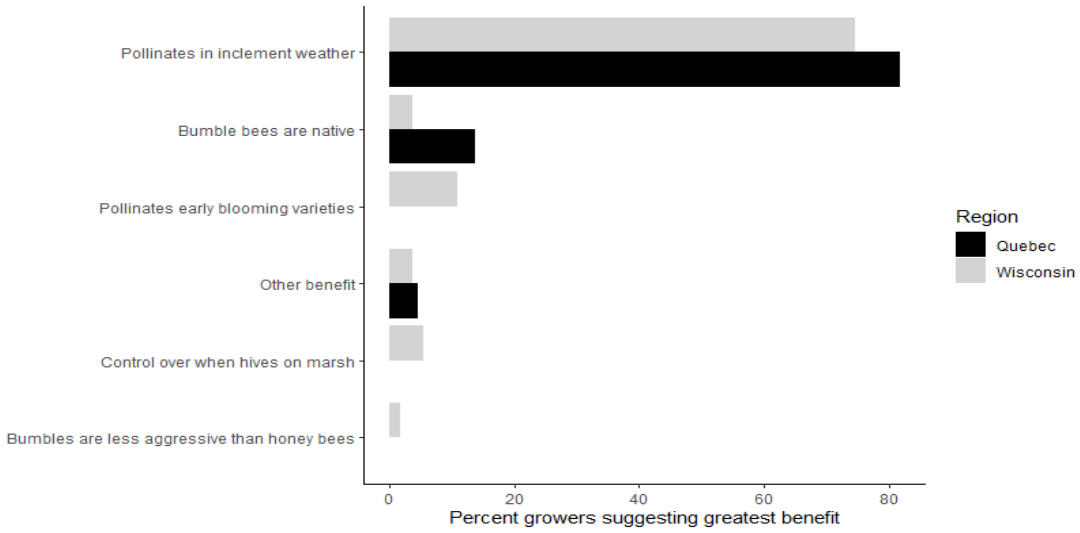


Figure 4. Proposed benefits of managed bumble bees as pollinators of cranberry in WI and QC.

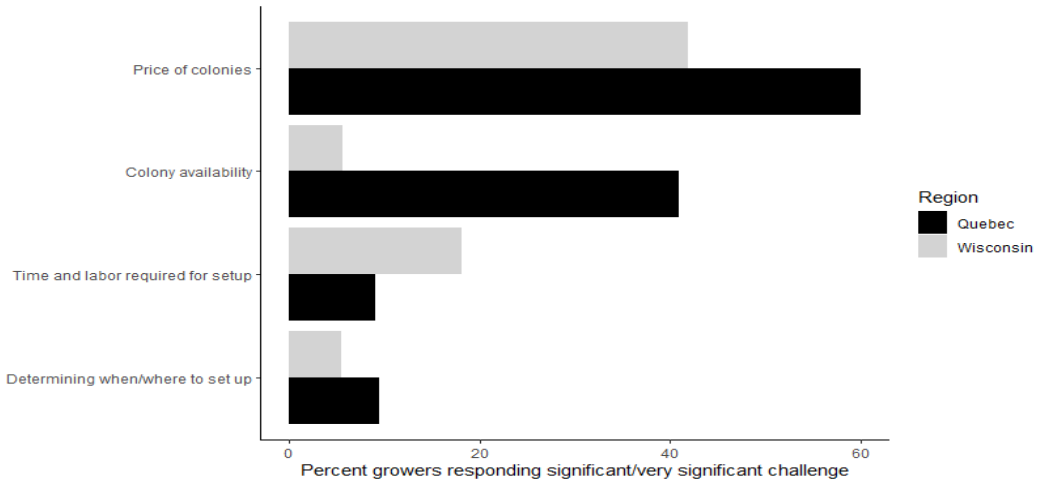


Figure 5. Proposed challenges of managed bumble bees as pollinators of cranberry in WI and QC.

Cranberry growers in Wisconsin and Quebec share a large number of similarities, including in the characteristics of their marshes, their pollination practices, the factors that determine those practices, and their perceptions of the benefits and challenges of utilizing managed bumble bees for cranberry pollination. Additionally, crop consultants, beekeepers, and university specialists are all well regarded sources of information on pollination for growers in both of these regions, highlighting the importance of communication between these groups to further the cause of sustainability in cranberry pollination. Future research on the costs and benefits of diversifying pollination strategies for cranberry, including more widespread utilization of managed bumble bees, is warranted.

We would like to thank the cranberry growers in Wisconsin and Quebec who participated in this voluntary survey and WBC and WI DATCP for funding part of this work.

SUPER ROOTS FOR SUPER FRUITS?
ERICOID MYCORRHIZAL FUNGI IN ASSOCIATION WITH VACCINIUM MACROCARPON

BECCA HONEYBALL[1], AMAYA ATUCHA[1], and JUAN ZALAPA[1,2]

Department of Horticulture, University of Wisconsin-Madison, WI; USDA-ARS, Vegetable Crop Research Unit, Madison, WI

Mycorrhizal fungi are beneficial root fungi that form a symbiosis (a mutually beneficial relationship) with host plants. Soil scientists estimate that about 80-90% of all terrestrial plant species experience some form of mycorrhizal symbiosis, and that mycorrhizal fungi make up ~30% of all soil-borne organisms [8]. There are several distinct categories of mycorrhizal fungi (pictured below), all with different infection styles [1]. All share the feature of forming mutually beneficial associations with host roots.

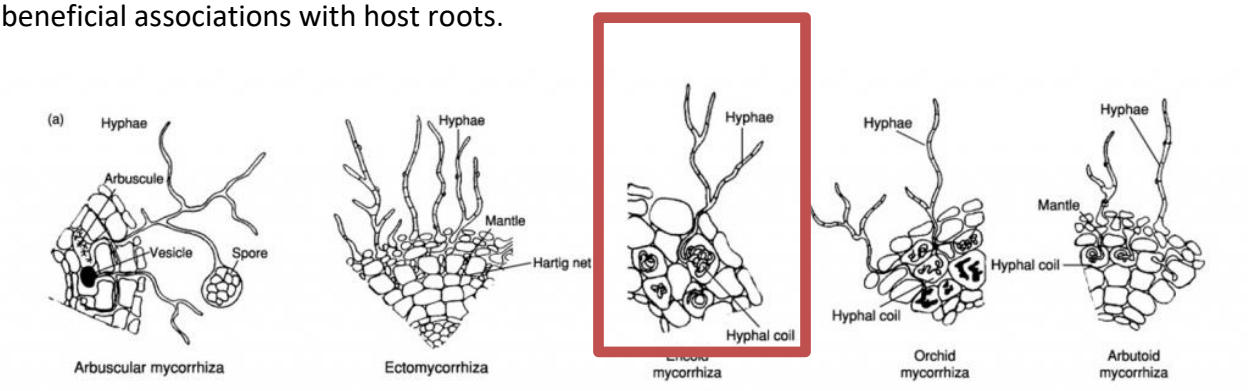
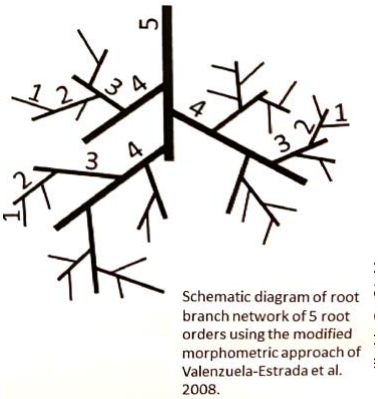


Figure 1. Differential relationships between fungal and plant structures for each of the main types of mycorrhizal associations; originally printed in Selosse et al. (1998). "Trends in Ecology and Evolution", vol. 13: 15–20. Retrieved from Egerton-Warburton et al (2005) via Elsevier [1]. Ericoid Mycorrhizal Fungi are boxed in orange.

However, some mycorrhizal groups have been more thoroughly studied than others; among the less-understood groupings are the Ericoid Mycorrhizal Fungi (ErMF), which bond with ericaceous plants like cranberry [9]. The primary components of the symbiosis are (1) hyphal coils that form inside the root skin cell (rhizodermal cells) and (2) the hyphae that reach out into the soil. This is one of the most understudied groups, but at the same time, the most important group for those of us working with cranberry. We could be missing opportunities to benefit from this relationship.



Schematic diagram of root branch network of 5 root orders using the modified morphometric approach of Valenzuela-Estrada et al. 2008.

Given the delicacy of cranberry roots, this work has been and will continue to be challenging. The slow-growing, ultra-fine hair roots are already fragile, and we see the most fungal colonization in the finest, youngest root tissue (designated 1st

and 2nd order roots). Figure 2 (right) shows a diagram of these new-growth hair roots [2].

The microscopy images below depict the cells of a colonized cranberry root with the blue stain indicating the fungal tissue. Figure 3a shows coils of hyphae in blue, filling the cells they occupy.

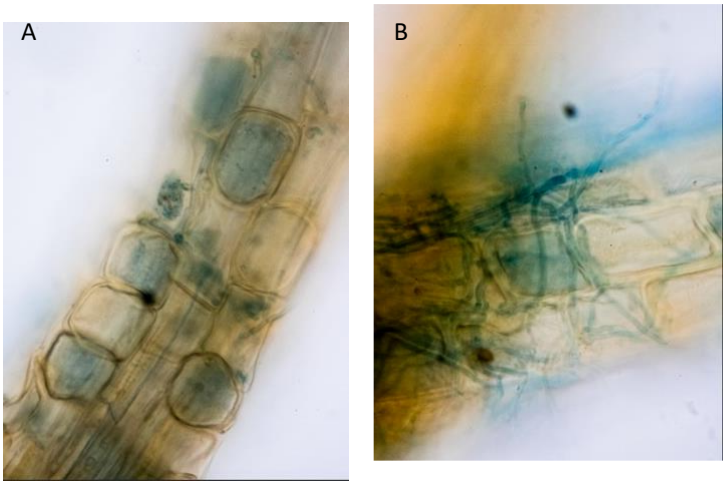


Figure 3. (a) Hyphal network and (b) fungal coils. 3a shows the network of hyphae that surround the thinnest root. 3b depicts several instances of the hyphal coils that infect rhizodermal cells. Both images taken at 600–960× magnification on an Olympus BX60 microscope and Martin Microscope attachment for Canon camera.

Figure 3b shows the network of hyphae outside, surrounding the root. This symbiosis is beneficial because ErMF evolved very specifically to reside in nutrient-limiting soils, with low pH, decreased available metals, and poor free drainage. These highly specialized root fungi form a symbiotic association with the roots of ericaceous host plants, and these associations facilitate the uptake of water and nutrients (especially phosphorus, zinc, and copper) by extending the plant's root system with the tendril-like hyphae [8]. This increases surface area of roots, which is particularly helpful in environments of moisture stress and low nutrient availability, improving plant growth and vigor.

Although ErMF are understudied in comparison to other mycorrhizal groups, there has been work done in cranberry to establish their role in Nitrogen pathways. Although we know that cranberries preferentially uptake Nitrogen as ammonium, ErMF allow cranberry to access other forms of Nitrogen, specifically, nitrate from organic matter like leaf litter. Ammonium and Nitrate uptake pathways are well-established, but other nutrients are less explored. Part of this project will look at the uptake of Phosphorus, to build on our knowledge of these pathways.

Recorded changes in annual Wisconsin rainfall over 57 years, from 1950 to 2007, provide indicators for the future as we contemplate additional impacts that we might observe from ErMF [3]. Some regions of cranberry acreage are experiencing increased rainfall, while others are getting less, indicating that we could see issues from both directions of water stress. ErMF have already been shown to alleviate stresses from drought and flooding in blueberries, boding well for our research outcomes [10]. This mitigation of water and nutrient stress could have a positive effect on plant survival in shifting climate [5,6,7].

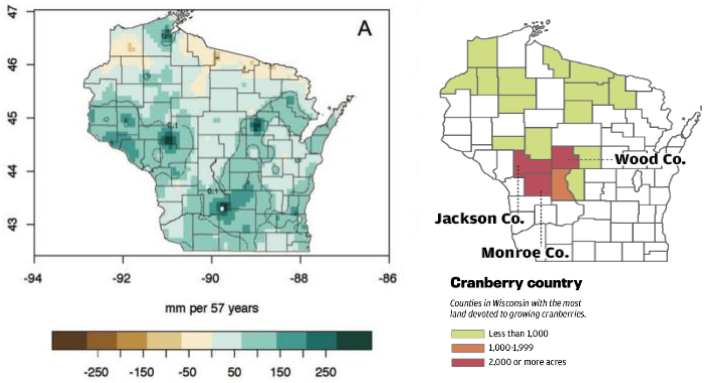


Figure 4. (a) Trends from 1950 to 2006 in total annual precipitation [3]. (b) Map of Cranberry Country by county, via the Wisconsin State Journal [4].

We know that ErMF help cranberry vines uptake otherwise unavailable nutrients through the hyphal network. We want to explore this area further, and our findings may eventually suggest adjustments in fertilization practices or reduced nutrient input for more efficient cranberry production. In brief overview of our project goals, we will first generate a measure of ErMF biodiversity across cultivated marshes in Wisconsin, as well as investigating how the fungi affect phosphorus uptake and plant performance under water stress (both drought and flooding) to assess stress mitigation possibilities.

References

[1] Egerton-Warburton et al, 2005. Mycorrhizal Fungi: Reference Module in Earth Systems and Environmental Sciences. Elsevier, 2013. ISBN 9780124095489, https://doi.org/10.1016/B978-0-12-409548-9.05226-X
[2] Valenzuela-Estrada LR, Vera-Caraballo V, Ruth LE, Eissenstat DM. Root anatomy, morphology, and longevity among root orders in Vaccinium corymbosum (Ericaceae). Am J Bot. 2008 Dec;95(12):1506-14. doi: 10.3732/ajb.0800092. Epub 2008 Nov 7. PMID: 21628158.
[3] Christopher J. Kucharik, Shawn P. Serbin, Steve Vavrus, Edward J. Hopkins & Melissa M. Motew(2010) Patterns of Climate Change Across Wisconsin From 1950 to 2006, Physical Geography,31:1, 1-28, DOI: 10.2747/0272-3646.31.1.1
[4] Adams, B. (2018, March 19). *History, culture, research, big business and talk of tariffs for Wisconsin's Cranberry Industry*. Madison.com. Retrieved February 15, 2021, from https://madison.com/wsj/business/history-culture-research-big-business-and-talk-of-tariffs-for-wisconsins-cranberry-industry/article_1a221993-525c-5f14-9ba4-3d797a8c61e9.html
[5] Baba et al, 2016. Microbes Environ. 31(2): 186-189
[6] Cairneey and Meharg, 2003. European Journal of Soil Science. 54(4): 735-740
[7] Jeliazkova and Percival, 2003. Canadian Journal of Plant Science. 83(3): 583-586
[8] O'Neil, 2018. Field Crops, Forages and Soils Updates for NNY. "What are Mycorrhizae and Should They Factor into Your Crop Management Plans?"'
[9] Vohník, M. Ericoid mycorrhizal symbiosis: theoretical background and methods for its comprehensive investigation. *Mycorrhiza* 30, 671–695 (2020). https://doi.org/10.1007/s00572-020-00989-1
[10] Mu, Deyu, Ning Du, and Janusz J. Zwiazek. 2021. "Inoculation with Ericoid Mycorrhizal Associations Alleviates Drought Stress in Lowland and Upland Velvetleaf Blueberry (*Vaccinium myrtilloides*) Seedlings" *Plants* 10, no. 12: 2786. https://doi.org/10.3390/plants10122786

CRANBERRY FRUIT MATURITY AND ITS RELATIONSHIP TO FRUIT FIRMNESS

Pedro Rojas, Beth Ann Workmaster, and Amaya Atucha

Department of Horticulture, University of Wisconsin-Madison, WI

The cranberry industry has experienced a rapid market shift from juice to higher value products, such as sweetened dried cranberries (SDC). SDC production require higher quality parameters such as evenly colored fruit, large and round fruit shape, fully fleshed fruit with the ability to maintain high firmness. These more discriminating fruit quality factors cause a large portion of the production (>20%) to be culled during processing and sold into the lower value juice concentrate market.

Fruit softening during ripening has been extensively studied in many fruit crops, and fruit firmness is a commonly used maturity indicator. However, until recently most cranberry fruit have been used for juice production or processing, and therefore there is very limited information on fruit ripening on cranberries, with the exception of fruit color, the main maturity indicator used in cranberry production. The goal of this project is to investigate changes in cranberry fruit firmness during the ripening period by evaluating physiological and anatomical changes in fruit, as well as preharvest factors that affect fruit softening. During this talk we will present preliminary results on several fruit traits, including fruit weight, fruit firmness, fruit elasticity, color, and fruit internal structure.

Preliminary results

During the first year of the project, two cultivars were selected based on their SDC production efficiency: high sweetened and dried cranberried production efficiency (HSDC) and low sweetened and dried cranberried production efficiency (LSDC). Fruit samples were collected every other week starting 14 days after full bloom until harvest.

Fresh fruit weight

A total of 150 fruits were randomly collected for each cultivar and individually weighted for all collection dates. The fruits from LSDC were heavier than those from HSDC for all collection dates (Fig. 1).

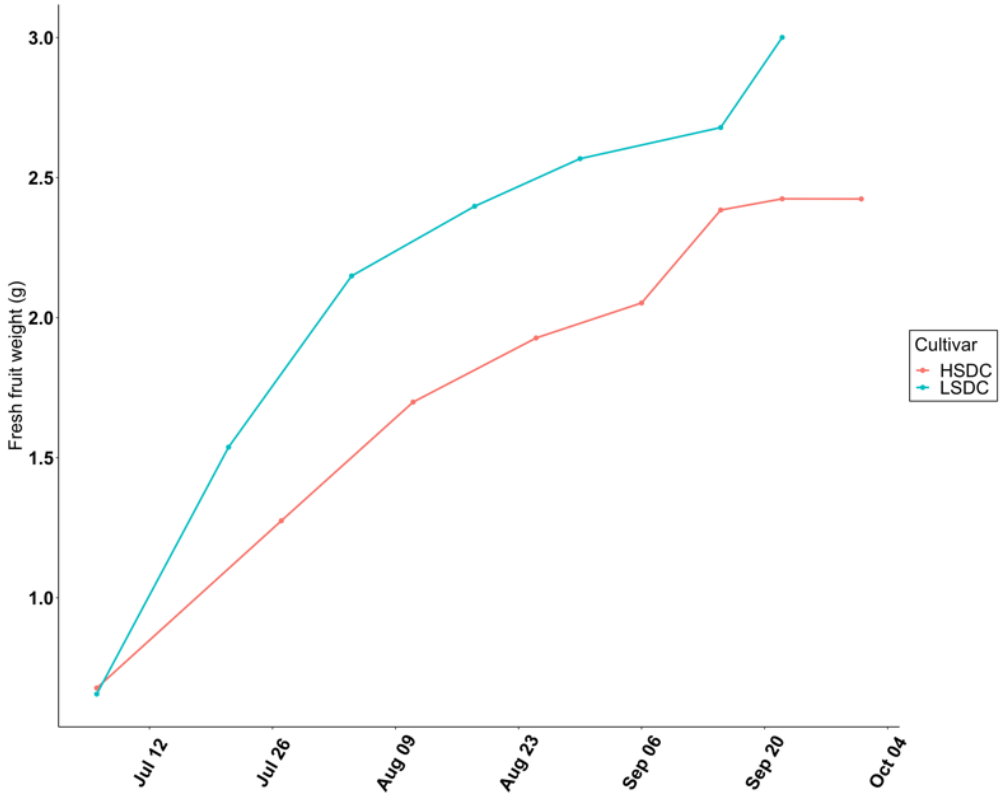


Figure 1. Fresh fruit weight (g) mean comparison between a cultivar with high production efficiency for sweetened and dried cranberry (HSDC) and one with low production efficiency for sweetened dried cranberries (LSDC) from July to October during the 2021 growing season.

Fruit Firmness

Similar to fruit weight, a random sample of 150 fruits per collection data and cultivar were evaluated individually for fruit firmness using a texture analyzer device. Fruit firmness is expressed as the force needed to compress 20% of the fruit (in grams). Fruit from the LSDC cultivar, had a continues increase in firmness until harvest, while HSDC has two different peaks, one when fruit color develops and the other close to harvest (Fig. 2). For both cultivars, the force needed to compress 20% of the fruit decreases as they get close to harvest.

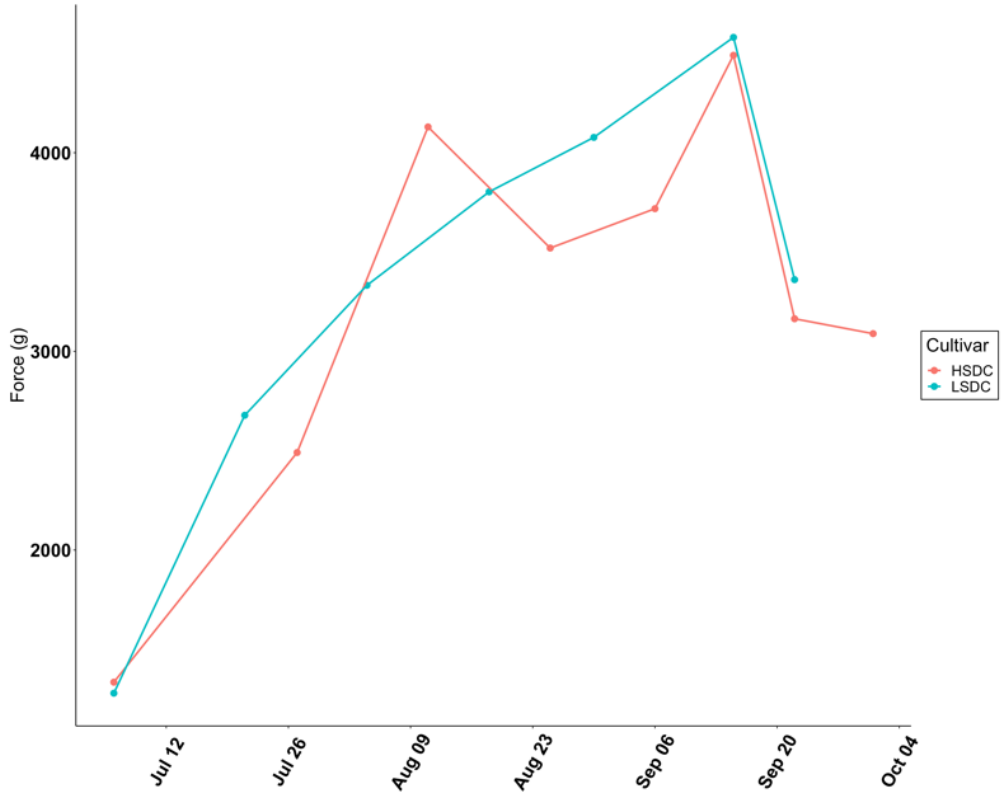


Figure 2. Fruit firmness in grams (g) expressed as the force needed to compress 20% the fruit volume comparison between a cultivar with high production efficiency for sweetened and dried cranberry (HSDC) and one with low production efficiency for sweetened dried cranberries (LSDC) from July to October during the 2021 growing season.

Fruit elasticity (Maximum contact pressure)

Fruit elasticity was evaluated using a similar procedure than for firmness with the texture analyzer. Fruit elasticity corresponds to a measurement that determines how fast the berry returns to its initial form after the 20% compression (MPa). Fruit elasticity, similar to fruit firmness, elasticity increased as the fruit develops during the season in the two cultivars and decreased closer to harvest (Fig. 3). However, when we compared the two cultivars, in general, the elasticity was higher for the HSDC cultivar.

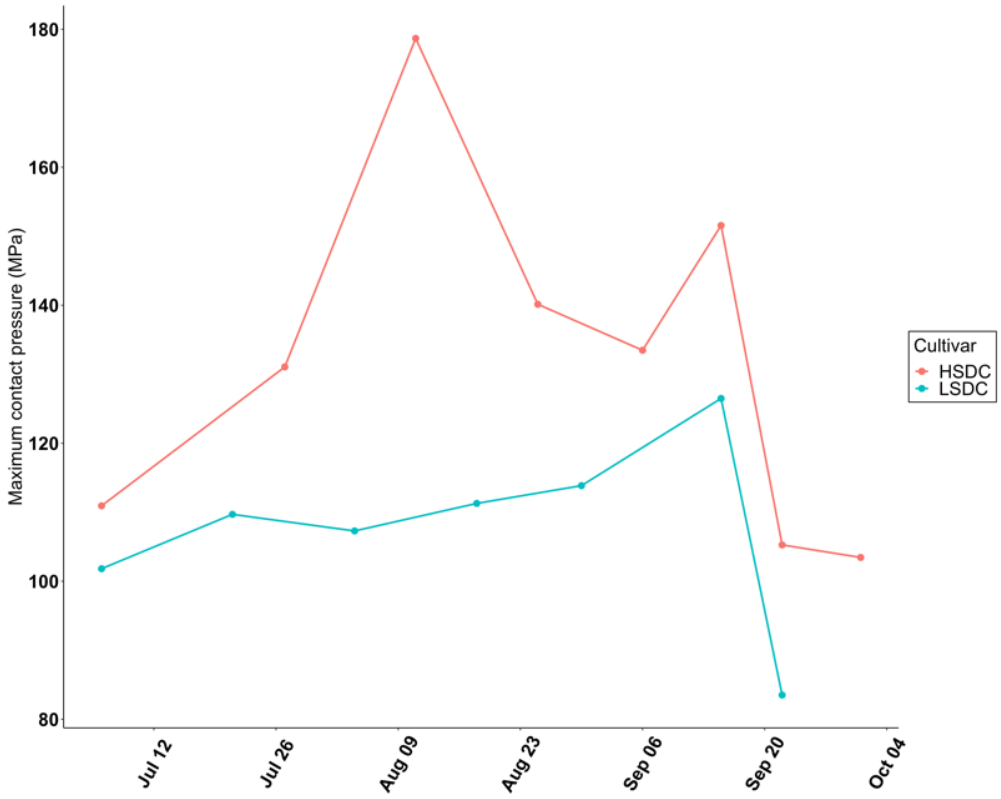


Figure 2. Fruit elasticity expressed as maximum contact pressure (MPa) comparison mean comparison between a cultivar with high production efficiency for sweetened and dried cranberry (HSDC) and one with low production efficiency for sweetened dried cranberries (LSDC) from July to October during the 2021 growing season.

Fruit color

A total of 150 fruits per cultivar and collection date were used for determined fruit color using an image analysis software (MATLAB) that returns a value in a gray scale, with 0 corresponding to no color at all and 1 means full red color. Fruit color developed as the season progress and reached its maximum value close to harvest (Fig. 4).

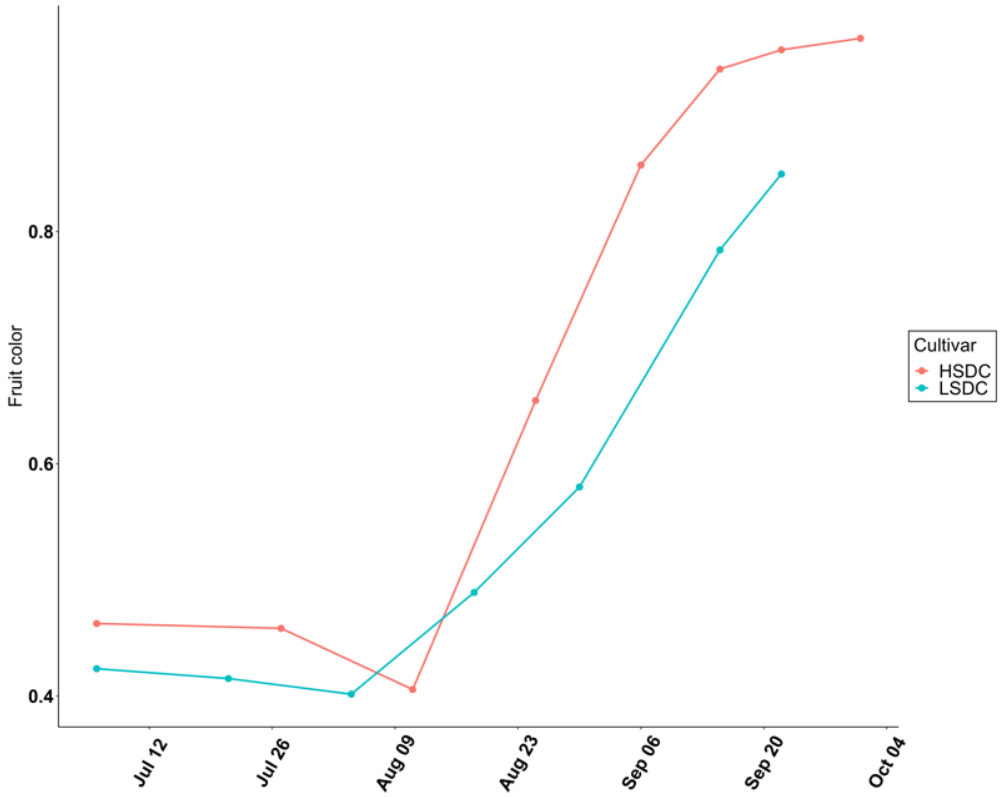


Figure 3. Fruit color determined using a gray scale (from 0 to 1; 0= no red color and 1= full red color) comparison mean comparison between a cultivar with high production efficiency for sweetened and dried cranberry (HSDC) and one with low production efficiency for sweetened dried cranberries (LSDC) from July to October during the 2021 growing season.

External to Internal flesh ratio

A total of 150 fruit per cultivar and collection date were measured using an image software analyzer (MATLAB) for calculating external to internal flesh ratio. The external flesh corresponds to the portion of the fruit that is next to the skin (epidermis), while the internal flesh corresponds to the pulp next to the air pockets. The external to internal flesh ratio did not vary during the first weeks of fruit development (Fig. 5). However, by the end of August, the ratio of HSDC cultivar was considerably higher, meaning that the external flesh was thicker in proportion to the internal flesh.

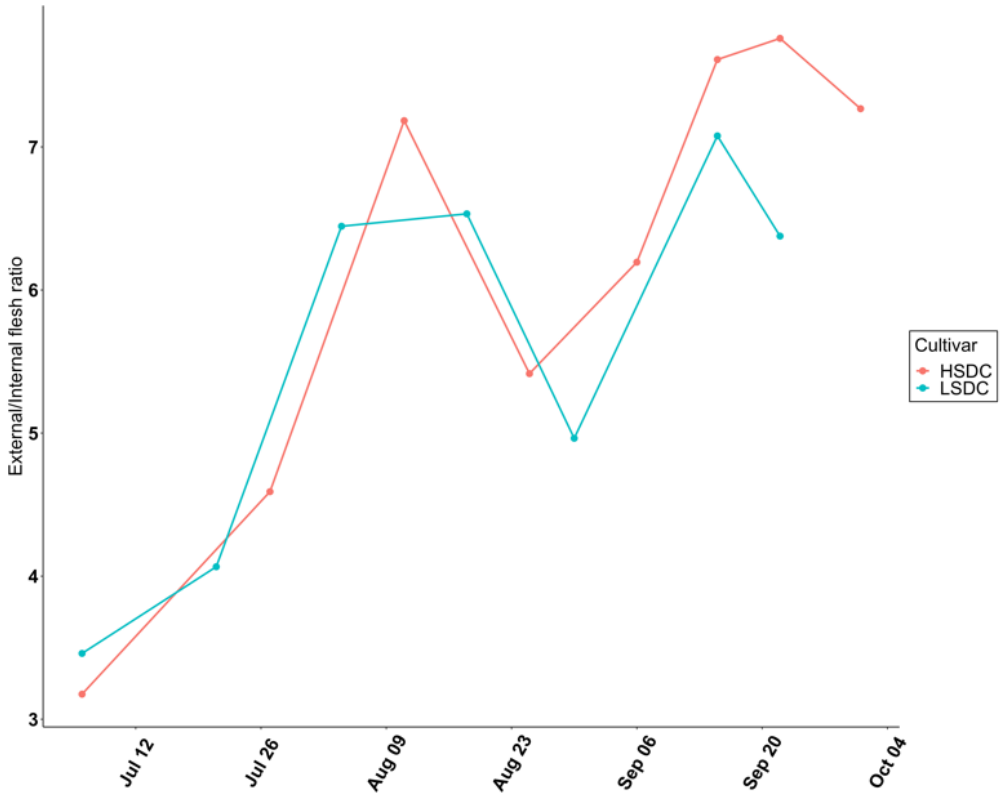


Figure 4. Fruit external to internal flesh ratio comparison mean comparison between a cultivar with high production efficiency for sweetened and dried cranberry (HSDC) and one with low production efficiency for sweetened dried cranberries (LSDC) from July to October during the 2021 growing season.

Flesh to air pocket ratio

The flesh to air pocket ratio was higher in the HSDC compared to the LSDC during all sampling dates (Figure 6), indicating that in the HSDC fruits the pulp was thicker than in the LSDC cultivars.

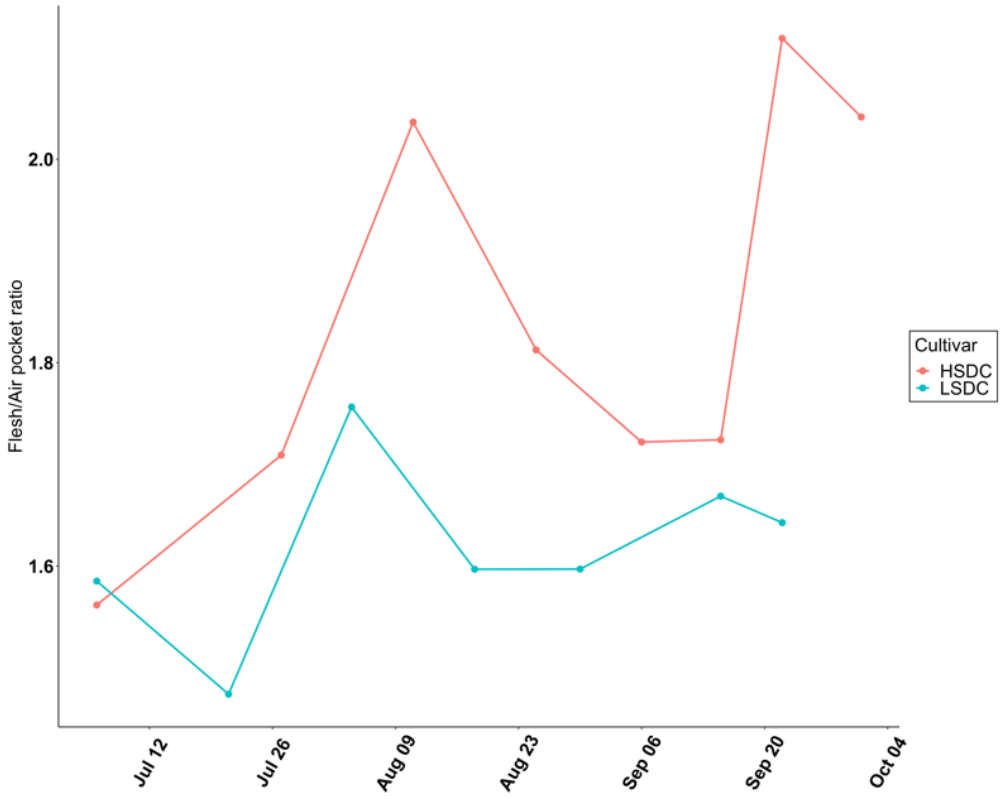


Figure 6. Flesh to air pocket ratio comparison between a cultivar with high production efficiency for sweetened and dried cranberry (HSDC) and one with low production efficiency for sweetened dried cranberries (LSDC) from July to October during the 2021 growing season.

Conclusion

Fruit firmness of HSDC compared to LSDC did not vary across the growing season but elasticity was considerably higher in the HSDC cultivar compared to LSDC. The LSDC fruits were heavier than those of the HSDC during all sampling dates. However, HSDC fruits had thicker pulp than LSDC, based on the flesh to air pocket ratio.

The next steps of the project are to compare these parameters with other internal and external anatomical fruit traits. This way, we want to understand how these components change during fruit development and how are they related to the fruit quality traits that we already measured.

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RELATIONSHIP OF CRANBERRY SOIL pH AND MICROBIAL COMPOSITION

NATHANIEL GAMBLE[1,2], ALLISON JONJAK[3], JUAN ZALAPA[1,2], JYOSTNA DEVI MURAI[1,2]

1 Department of Horticulture, University of Wisconsin-Madison, WI
2 USDA-ARS, Vegetable Crops Research Unit, Madison, WI
3 Division of Extension, University of Wisconsin-Madison, WI

Soil pH affects a variety of soil characteristics, including microbial activity, nutrient availability, soil remediation, nitrification, and denitrification – all key factors in regulating plants' abilities to absorb nutrients. Cranberry prefers acidic soils of a relatively narrow pH range (4.2 - 5.5). In our previous study, we found adverse effects of high soil pH on nutrient absorption resulting in a 40 to 60% of reduction in fruit size. To understand the specific effects of high soil pH on nutrient availability, absorption, and fruit size, we monitored these metrics over the course of the 2021 growing season in 3 proximally-located, similarly aged and managed Stevens beds: one control bed of optimal pH (4.5 - 5.0) and two high pH beds (6.2 - 7.4). In both high soil pH beds, we observed delayed developmental stages, reduced levels of macro (N & P) and micronutrients (Mn, Fe, Zn, Cu & Na) in upright and fruit tissue, increased levels of calcium and magnesium in soils, uprights, and fruits compared to the control.

To explain observed differences in the soils' nutritional compositions and the plants' abilities to acquire available nutrients, we have begun an exploration of cranberry soil microbiomes. To survive in acidic, nutrient-poor soil, wild cranberry relies on relationships with beneficial soil bacteria and mycorrhizal fungus to absorb vital nutrients. Many of these partnerships remain in cultivated cranberry beds, but their abundance and composition in relation to soil acidity are poorly understood.

With the goal of eventually understanding important microbial players (mycorrhizae and bacteria), their roles in cranberry production, and their relation to soil pH gradients, we extracted and sequenced microbial DNA from our control and high pH cranberry soils. Across all tested soils, we detected approximately 800 different species of archaea and bacteria. The number of bacteria detected was similar across soil pH. However, we detected significant differences in abundances of several important taxa that may contribute to nutrient availability and soil acidity – a few of which are highlighted here. The archaea phylum Thaumarchaeota (Fig. 1a) and bacteria phylum Nitrospirae (Fig. 1b) were both more abundant in high pH beds compared to the control bed. Microbes within these phyla are nitrifiers, converting ammonia present in the soil to nitrates. Given that cranberries acquire nitrogen in the form of ammonia, the greater abundance of these nitrifiers in high pH beds may contribute to lower levels of absorbed N in high pH plants compared to control plants. The bacterial class Acidobacteriia was significantly more abundant in the control bed compared to high pH soils (Fig. 1c). These bacteria are commonly found in acidic soils and help modulate critical biogeochemical cycles (carbon, nitrogen, and sulfur cycles), influencing plant growth.

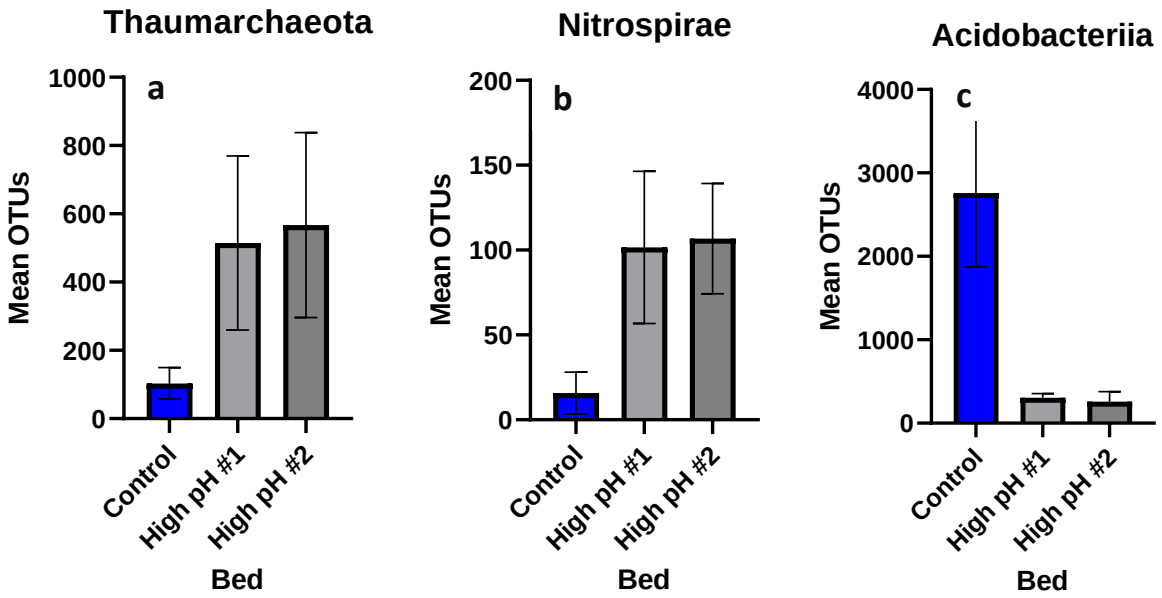


Figure 1 Average number of Operational Taxonomic Unit (OTUs), detected per sample in a) archaea phylum Thaumarchaeota, b) bacterial phylum Nitrospirae, and c) bacterial class Acidobacteriia. Thaumarchaeota and Nitrospirae were significantly more abundant in high pH soils compared to the control pH soils, whereas Acidobacteriia were significantly more abundant in the control pH beds compared to high pH beds.

We detected 342 species of fungi cumulatively present in all soils. Total fungal abundance was much higher in control soils than in high pH cranberry soils, with no significant differences in taxa across pH regimes. Higher fungal abundance in control soils is predictable given that soil fungi activity generally increases in acidic soils. Since cranberry evolved in acidic conditions, these plants may be better suited for soils colonized by more fungi than bacteria - which tend to dominate in mildly acidic to neutral soils.

Evidence of cranberry adaptation to acidic soil can be drawn from higher abundances of Ericoid mycorrhizal (ErM) species detected in control compared to high pH soils (Fig. 2). *Pezoloma ericae* (Fig. 2a), a fungus known to form ErM associations with cranberry, and *Pseudogymnoascus roseus* (Fig. 2b), a lesser known fungus observed forming ErM structures in a cranberry congeneric, *Vaccinium angustifolium*, were both significantly more abundant in the control beds versus high pH beds. The immense difference in abundance of these species across varying soil pH levels suggests that *P. ericae* and *P. roseus* may be suppressed by less acidic soils. If ubiquitous, suppression of ErM species could spell significant nutrient deficiency for mycorrhizal dependent cranberry. However, it should be noted that the common ErM species, *Oidiodendron maius*, was similarly abundant in all beds (Fig. 2c).

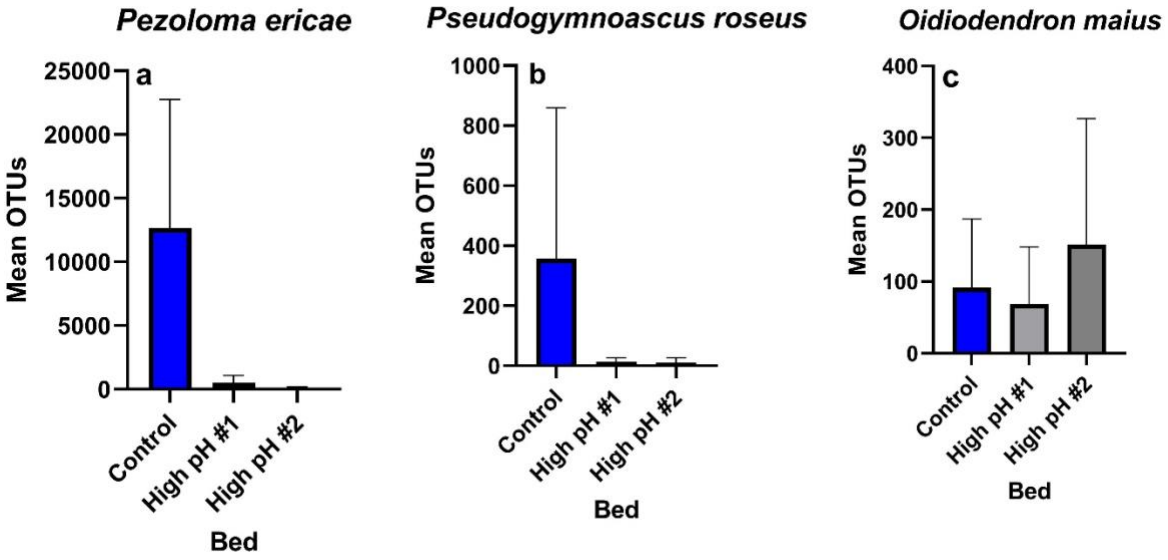


Figure 2 Average number of Operational Taxonomic Unit (OTUs) detected per sample in Ericoid mycorrhizal species a) Pezoloma ericae and b) Pseudogymnoasus roseus c) Oidiodendron maius. Ericoid mycorrhizal species Pezoloma ericae and Pseudogymnoascus rosues were significantly more abundant in the control pH soil compared to high pH soils, Oidiodendron maius was not significantly different.

As the soil microbiome is vast and microbial function is not always obvious, the taxa selected here merely represent the rough beginning toward elucidating the relationship between cranberry soil pH and microbial composition. To continue this work, we plan on expanding the scope of our sampling to include additional beds with a wide pH range and consider the rhizosphere (the fine layer of soil surrounding root surfaces) and root endosphere (microbes within the root). We will also conduct further experiments to determine the degree to which soil pH and other environmental factors shape microbial communities. Eventually, we hope to use this microbial knowledge to treat pH problems in cranberry soils in a natural way that improves nutrient absorption and production.

NEW TARGETS AND TIMINGS FOR OUR WI NEMATODES

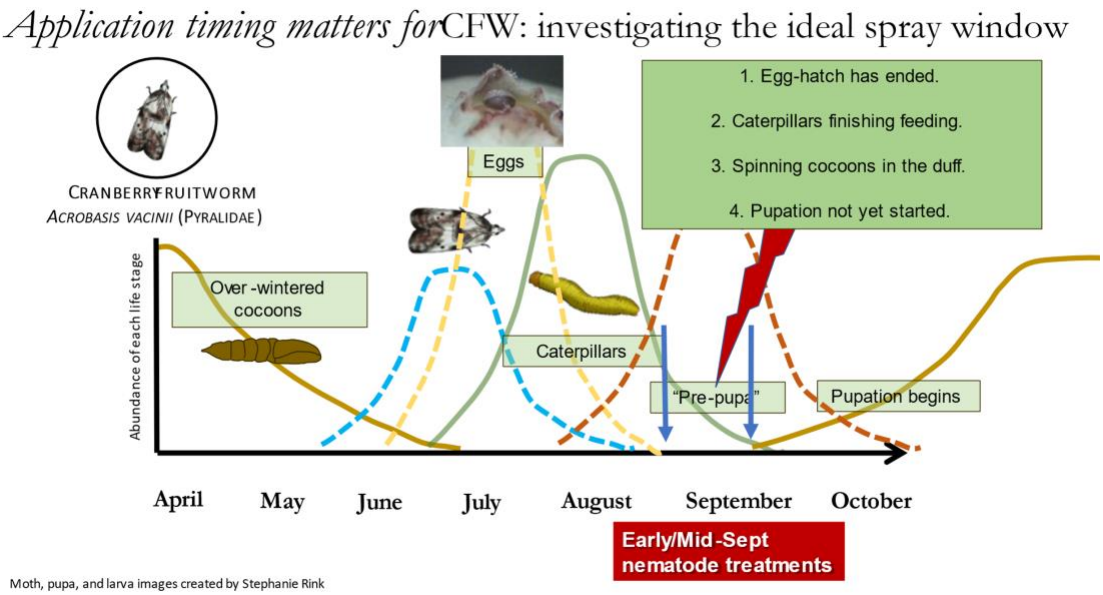
SHAWN A. STEFFAN[1, 2]

[1]USDA-ARS, Madison, WI, [2]Dept. of Entomology, UW-Madison

For years now, a nematode-based bio-insecticide has been in development for US cranberries that uses native Wisconsin nematodes as the killing agents (Ye et al., 2018; Foye & Steffan, 2019). These two nematode species are *Oscheius onirici* and *Heterorhabditis georgiana*. Together, they hunt down and attack insects that spend part of their lifecycle in the soil (or in the litter layer on top of the soil). Given that many insects in the cranberry system spend much of their lives in the soil, they are easy targets for nematodes. *Oscheius onirici* is an exceedingly rare nematode (the species was originally described from specimens found in an Italian cave). *H. georgiana* is also relatively uncommon, but not as rare as *O. onirici*. Both nematodes are highly virulent against all insects we have screened against them. Much laboratory work has demonstrated this, and subsequent field applications were undertaken in 2018-2020 at sites in Wisconsin. In the past, applications have been made to beds in late June and early July, using the "installment plan" system, in which only fresh, newly emerged nematodes were applied at relatively short time intervals (4-7 days between each), ultimately totally a desired rate (6.2 - 12.4M nematodes/ acre). At one site, a 55.1% reduction in flea beetle populations was documented. At a second site, 76% and 91.3% reductions were observed. These timings, however, were obviously geared toward flea beetles.

We wanted to see if there was a better timing for cranberry fruitworm (CFW), so in 2021, we set up an experiment looking at a late summer nematode application timing. This timing is expected to be a window of time corresponding to the 'gap' between larval feeding and the start of pupation. The figure below shows where this 'window of time' likely exists.

The reason for focusing on this narrow, late-summer window (early to mid-Sept) is that the entire CFW population should be in a vulnerable stage. The egg stage and pupal stage are not susceptible to the nematodes (they're effectively sealed, without ports of entry for the nematodes). Basically, the nematodes cannot penetrate the CFW egg or pupa, and if they cannot get in, they cannot unload their bacteria, and it is the bacteria that do the killing of the insect host.



Considering that the larvae (caterpillars) spend most of their time feeding safely within fruit, they are only vulnerable when the caterpillars leave the fruit to pupate in the duff or soil. This is where the nematodes can find and kill them. However, there is not a lot of time before the caterpillar starts to pupate. We do know that the caterpillars must first spend time finding a safe place to spend the fall/winter, then they have to spin up a hibernaculum (a 'sleeping bag' for winter), and then initiate pupation. It takes time for this process, and in the meantime, nematodes can find them, penetrate their hibernaculum, and kill them. So, the application of the nematodes needs to be done at a time corresponding to the completion of larval feeding, yet before the caterpillar turns into a pupa. We set up a randomized complete block trial in which 100' x 4' plots (each replicated four times) were treated with either 1) our WI nematodes, 2) Koppert nematodes ('capsanem' product), or an untreated control (water only). We will assess the efficacy of these treatments in the summer of 2022. We will also look at how well these treatments affect flea beetles and sparganothis fruitworm, since both are likely present and vulnerable in the duff layers at the same time that CFW caterpillars are.

References Cited

Foye, S., and S.A. Steffan. 2019. Two native Wisconsin nematodes represent virulent biocontrol agents in cranberries. **Biological Control** 138:104042.

Steffan, S.A., M.E. Singleton, J. Sojka, E.M. Chasen, A.E. Deutsch, J.E. Zalapa, and C. Guedot. 2017. Flight synchrony among the major moth pests of cranberries in the Upper Midwest, USA. **Insects** 8:1-9.

Ye, W., S. Foye, A.E. MacGuidwin, and S.A. Steffan. 2018. Incidence of *Oscheius onirici*, a potentially entomopathogenic nematode from the marshlands of Wisconsin, USA. **Journal of Nematology** 1: 9-26.

QUANTIFYING WEED IMPACT ON CRANBERRY YIELD and QUALITY

JED COLQUHOUN

Department Of Horticulture, University of Wisconsin-Madison, WI

Despite over 200 years of commercial production, objective quantification of weed impacts on cranberry yield and quality has not been documented. Previous attempts have focused largely on the use of expert opinions to subjectively "rank" weed severity. In this research, the objective was to use common cranberry weed species to quantify the impact of weed density, groundcover and biomass on several cranberry yield components and related interactions with other cranberry pests. The long-term goal is to build a "library" of objective weed impact information that growers and consultants could use to make weed management decisions, such as balancing control costs with the weed species' economic impact on production. Also, the interaction of weeds with other cranberry pests, such as insects and plant pathogens, can be documented relative to berry yield and quality and in a way that is useful in making integrated pest management decisions if this relationship is consistent over production years.

The results for dewberry provide a prime example of how simple it can be to quantify weed impact severity in terms of cranberry yield and quality reduction. In this case, the relationship between dewberry growth measures and marketable cranberry yield were highly statistically significant and consistent across growing seasons. A simple visual estimation of dewberry groundcover was sufficiently predictive of cranberry yield and comparable to physical measures of dewberry biomass (Figure 1). Additionally, cranberry color loss was significantly correlated with both dewberry biomass and groundcover.

Practically, this library of weed impact information can be used to educate growers, consultants, agrichemical companies and regulators about the impact of weeds on cranberry yield and quality. Continuing to use dewberry as an example, maximum yield loss over the two study years ranged from 75 to 95% - much greater than anticipated. Just 20% dewberry groundcover reduced cranberry yield by about 45 barrels per acre.

Observations were similar for other common weed species, such as maple and yellow loosestrife. Future research efforts will continue to build this weed impact library across species and years, and this information will be made available to the cranberry community.

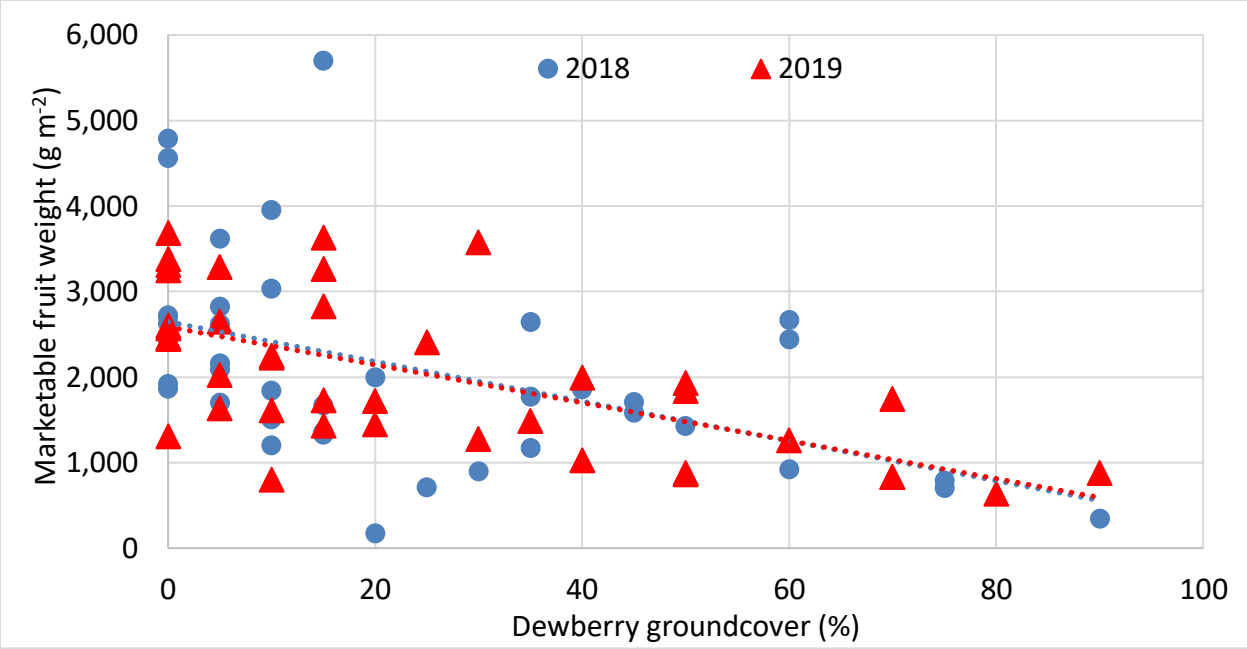


Figure 1. 'Stevens' cranberry marketable fruit weight relative to dewberry groundcover in 2018 and 2019.

CRANBERRY PEST MANAGEMENT PROGRAM – REVIEW OF 2021 FIELD TRIALS

ALLISON JONJAK[4], JED COLQUHOUN[1], CHRISTELLE GUÉDOT[2], LESLIE HOLLAND[3] and SHAWN STEFFAN[5]

[1]Department of Horticulture, [2]Department of Entomology, [3]Department of Plant Pathology, [4]Division of Extension, University of Wisconsin-Madison; [5]USDA-ARS, Madison, WI

FUNGICIDES & DISEASES

2021 Disease Status – The 2021 growing season was characterized by warm weather in early spring, followed by dramatic Memorial Day weekend cooldowns, and several days at or above 90°F early into the summer. Cranberries progressed through bloom very rapidly, challenging growers to time fungicide applications according to plan. Degree days increased rapidly throughout bloom, and a wetter than usual summer saw vines staying damp for long periods. These conditions were conducive to disease development. Consequently, disease pressure was high across the Wisconsin cranberry production areas.

• Proline and Abound + Indar are the industry standards for fruit rot management.

• In 2021, three disease field trials were conducted for early rot and fruit rot.

• A candidate fungicide screen tested products in five FRAC groups not currently registered in cranberry. The screens indicated that (in addition to grower standards), FRAC 7 and FRAC 12 show some promise against the fruit rot disease complex.

• A reduced risk fungicide candidate screen tested three modes of action which are OMRI-listed for use in organic agriculture. Results were not very promising—biological control agents (BCA) perform best when there is low disease pressure, and 2021 disease pressure at the test site was high. The most promising BCA will be tested in future years.

• A trial evaluating use patterns compared the application of grower standard chemistries in various timings: a 2-part application (at 15% and 75%) bloom vs the same chemistry in a single spray at 50% bloom. Consistency of the trial was compromised; this trial will be repeated next year.

Factors Influencing Disease Severity Three decision factors may be considered in determining the need for the number of fungicide applications for a season: 1) if April and/or May are frequently wet from precipitation and/or frost protection irrigation there may be an increased potential for diseases 2) if April and May are warm there may be an increased potential for diseases and 3) if the bed has a chronic history of disease.

Mancozeb MRL review underway

Mancozeb is no longer authorized for use in the European Union (EU) since January 2021. The EU's risk-based maximum residue limit (MRL) review for Mancozeb is still underway. The timeline for a decision on an adjusted MRL is thought to happen sometime this year. Updates will be provided as available through the Cranberry Crop Management Journal.

Chlorothalonil

The MRL for chlorothalonil was lowered to 0.01 ppm in 2021 for fruits destined for the EU market. On February 10, 2022, Health Canada's Pest Management Regulatory Agency published a proposed special review decision to cancel all food uses of chlorothalonil and revoke the MRLs; however, continued registration of greenhouse ornamental use is proposed. Chlorothalonil is also undergoing registration review in the US. Updates will be provided as available through the Cranberry Crop Management Journal.

INSECTICIDES AND INSECTS

2021 Insect Review – Insect pressure in 2021 was within the normal range: cranberry fruitworm (CFW) and sparganothis fruitworm were present and required control. Tipworm and fireworm were sporadic and individual producers managed them accordingly. Blunt-Nosed Leaf Hoppers (BNLH) were present in pre-bloom sweeps, leading many producers in impacted areas to apply pre-bloom treatments—these treatments were very effective and BNLH adults post-bloom were rare. Flea beetle continues to impact yields due to their high prevalence and long emergence window which precludes the use of several effective chemistries with long PHIs or handler restrictions.

• Lorsban was used in 2021 against BNLH, but is no longer allowed on fruit crops in 2022 and forward.

• In 2022, field trials were conducted to test new chemistries against BNLH and against flea beetle (due to PHI restrictions making late-season control challenging). A trial was also conducted evaluating spray timings for control of fruitworm.

• A trial tested five active ingredients (6 registered products, and 2 not-yet-registered on cranberry products) against Blunt Nosed Leaf Hoppers pre-bloom.

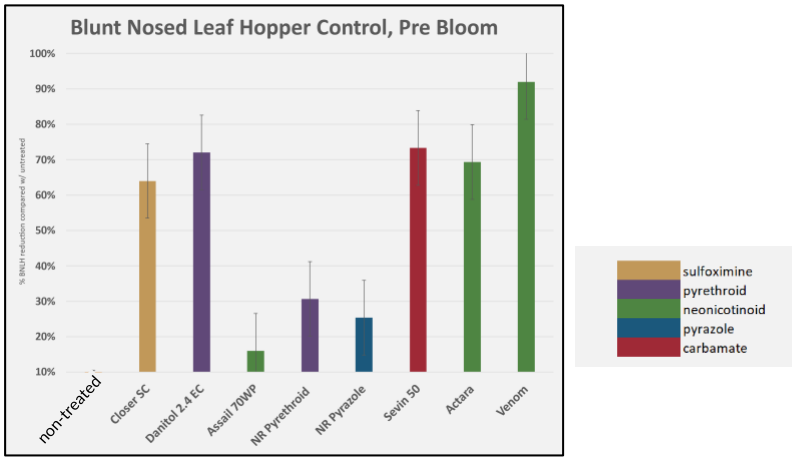


Fig 1. Pre-bloom BNLH control expressed as % reduction compared with non-treated control

A post-bloom test was run as well, but no BNLH were present at the trial location post-bloom. Below is data that was collected in 2020 for BNLH adult trials:

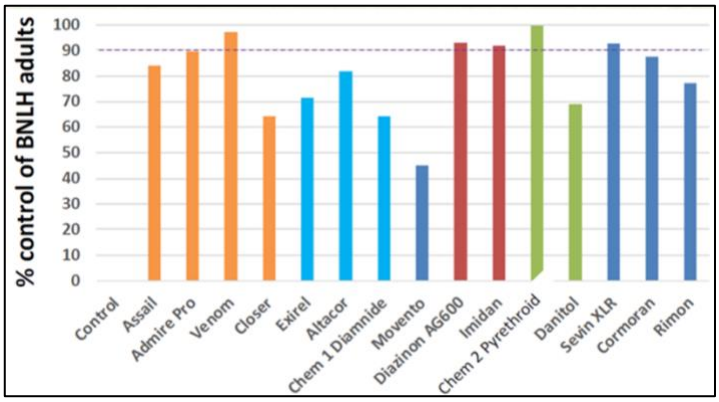


Fig 2. Post-bloom BNLH control expressed as % reduction compared with non-treated control. 2020 data.

• A trial tested four active ingredients, including PHIs ranging from 1 day to 7 days, against cranberry flea beetle. The trial was conducted in a patchy population, but both Venom and a not-yet-registered chemistry showed promise. This trial will be repeated on a larger acreage in 2022.

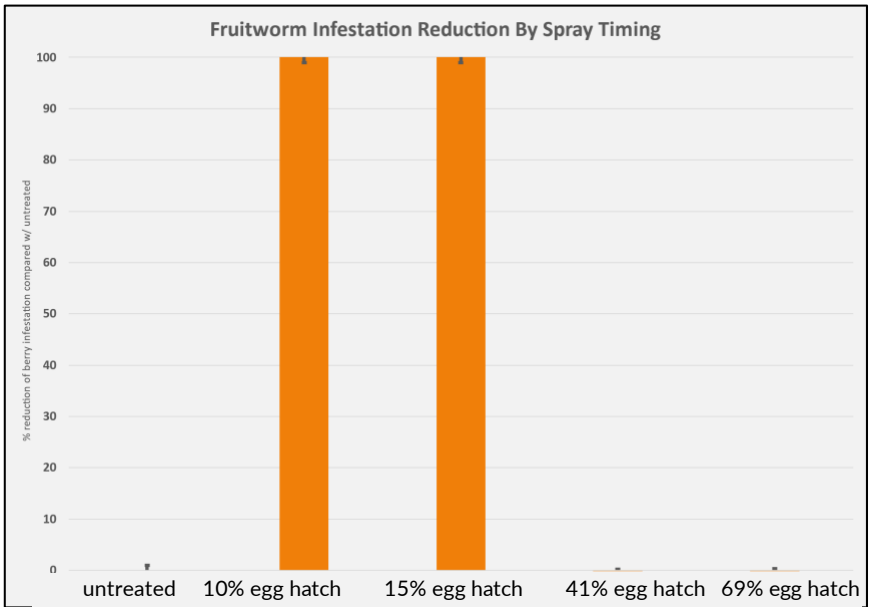


Fig 3. Fruitworm-infested berries in 10% hatch, 15% hatch, 41% hatch, and 69% hatch, compared with non-treated control.

• A trial investigated the importance of using % egg-hatch as the basis for treatment timings for sparganothis fruitworm. Based on past work, the 10-25% egg-hatch window appeared to be

ideal for sparganothis populations. Using Degree Days calculated for sparganothis, applications were applied at **10%** egg hatch (this year, June 19); **15%** (June 23rd), **41%** (July 2nd), and **69%** (July 13th). The 10% hatch timing and the 15% hatch timing were very effective (as measured by counts of infested berries), while the 41% timing and the 69% timing provided nearly no control. This provides further supporting evidence for a sparganothis treatment window corresponding to 10-25% egg-hatch.

New Insecticides

Fanfare 2EC is a bifenthrin from ADAMA. A supplemental label for cranberry for 2022-2024 is available here: http://www.cdms.net/ldat/ldC86002.pdf . Fanfare's PHI is 30 days and REI is 12 hours. A maximum of 3 applications can be made in a year, and the use rate is 6.4 fl oz/acre. Because of its high toxicity to fish and aquatic invertebrates, we recommend 3 days of water holding. It is also highly toxic to bees. The best fit in Wisconsin will be for pre-bloom BNLH, to avoid pollinator toxicity as well as residue and MRL issues for late season applications.

WEEDS AND HERBICIDES

2021 Weed Status – Weeds that are not being controlled by grower standard herbicide programs include maples, willows, popples, oaks, dewberry, northern St Johnswort, leatherleaf, poison ivy, and mosses.

• In 2021, three trials were run to explore crop safety of experimental pre-emergence herbicides, experimental post-emergence herbicides, and the effectiveness of plant growth hormones in increasing cranberry vine vigor.

• Five experimental dormant pre-emerge herbicides were applied and compared with Callisto, Casoron, and a non-treated control. In this vine-injury screening, Experimental 3 had distinct crop damage, especially 6 weeks after application. The remaining experimental herbicides resulted in minimal crop injury and cranberry yield was similar to where Callisto or Casoron was applied. In 2022, we'll continue to evaluate these experimental herbicides with a particular focus on the weed control spectrum.

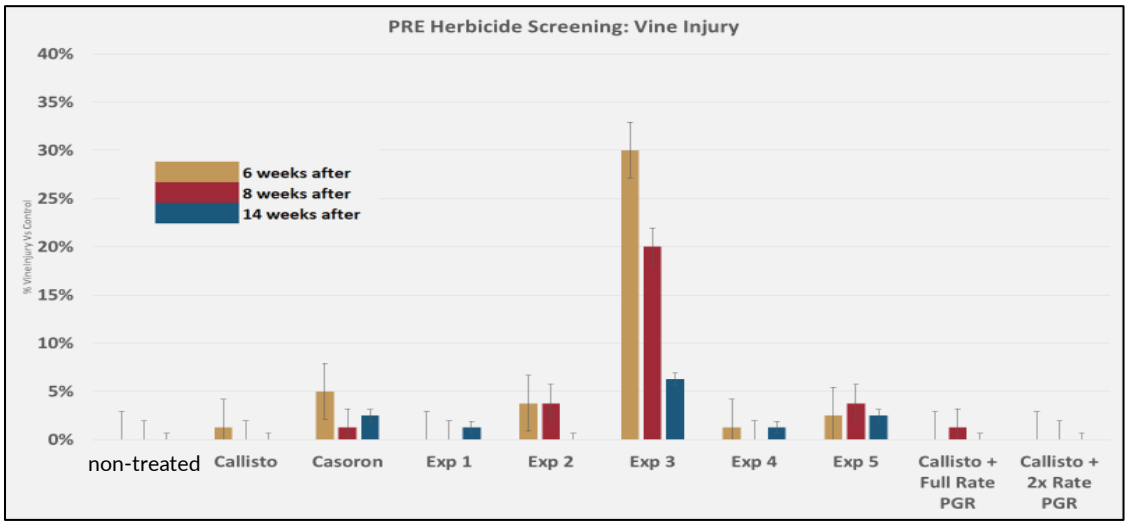


Fig 4. Cranberry vine injury observed 6, 8, and 14 weeks after applications of registered and experimental herbicides.

• An experimental plant growth regulator (PGR) was applied pre-bloom with Callisto to test crop-safety and to determine whether vine growth was enhanced. The PGR enhanced cranberry upright growth by about 10 to 15%, but berry yield was similar to Callisto without PGR.

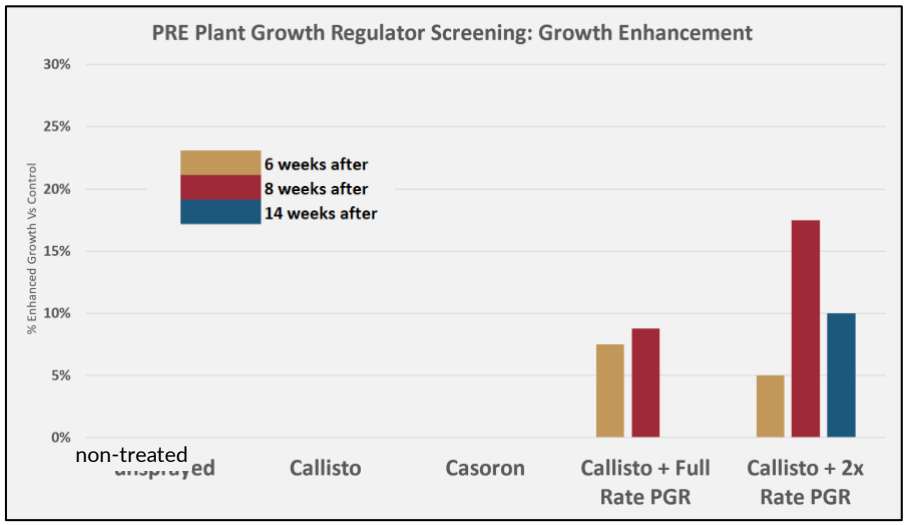


Fig 5. Cranberry vine growth enhancement evaluated 6, 8, and 14 weeks after application of a growth regulator.

• Two experimental herbicides were applied at two timings (pre- and post-bloom) and at multiple rates to explore crop safety and weed control compared to Callisto. Crop injury and yield reductions were significant, particularly in the pre-bloom application where rates were higher than those applied post-bloom. The herbicide registrant later recognized that the new formulation they supplied included MSO for a different crop market, and we added NIS, which was likely the cause of high injury levels. In 2022, we'll evaluate the experimental herbicide without the MSO and at lower rates. The herbicide showed promise in controlling maple and dewberry in the 2021 experiment.

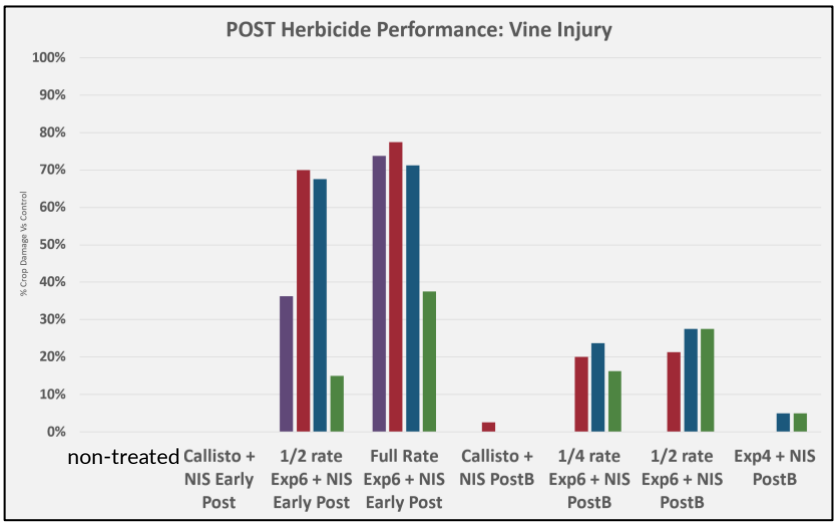


Fig 6. Cranberry vine injury observed after pre- and post-bloom applications of registered and experimental herbicides.

ALWAYS REMEMBER TO: 1) Read the label and 2) Check with the handler for approval to use pesticides.

2022 CRANBERRY SCHOOL GROWER SURVEY RESULTS

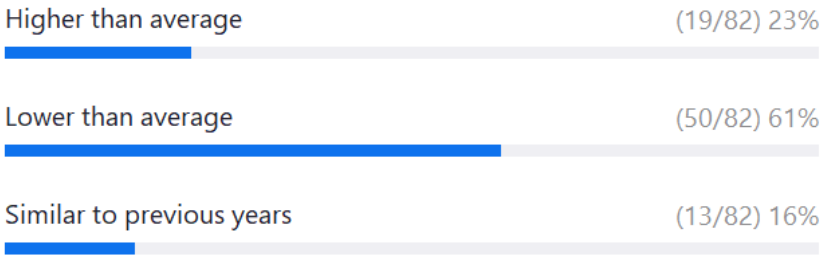
CHRISTELLE GUÉDOT[1] and ALLISON JONJAK[3]

[1]Dept. of Entomology, UW-Madison; [2]Division of Extension UW-Madison

Results of the live survey of growers present at the Virtual 2022 Cranberry School are presented below. The survey was conducted using Zoom. Questions were displayed on screens and respondents were allowed to select answers, live and anonymously. After all responses were collected, the polling was closed, and the results of the survey were displayed on the screens. Due to the virtual format this year, responses were collected live and are displayed as they appeared during the meeting.

1. In the 2021 yields were: (Single Choice) *

82/82 (100%) answered



1. In 2021 fruit size was: (Single Choice) *

82/82 (100%) answered

1. In 2021, fruit firmness was: (Single Choice) *

83/83 (100%) answered

a. Similar to previous years	(64/83) 77%
b. Better than in previous years	(9/83) 11%
c. Worse than in previous years	(10/83) 12%

1. In 2021, fruit rot incidence was:: (Single Choice) *

83/83 (100%) answered

a. Similar to previous years	(36/83) 43%
b. Lower than in previous years	(19/83) 23%
c. Higher than in previous years	(28/83) 34%

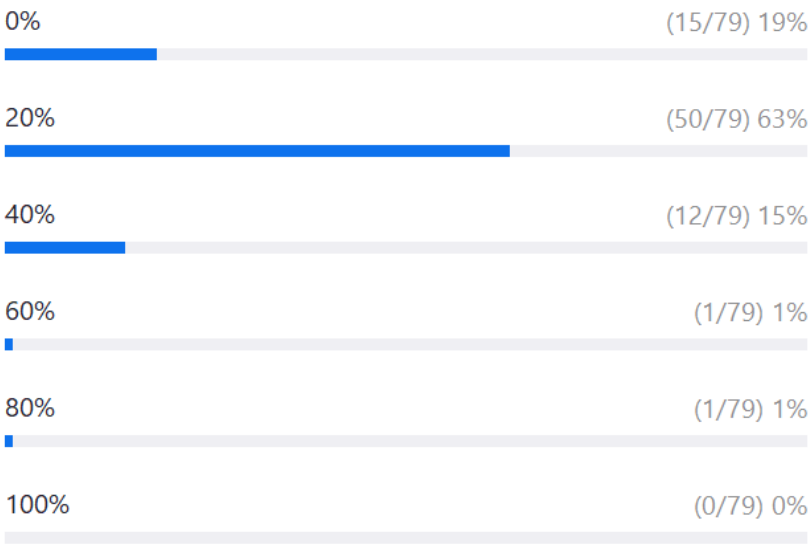
1. Did you have yield losses due to cold damage during 2021: (Single Choice) *

82/82 (100%) answered

Yes	(32/82) 39%
No	(31/82) 38%
I'm not sure	(19/82) 23%

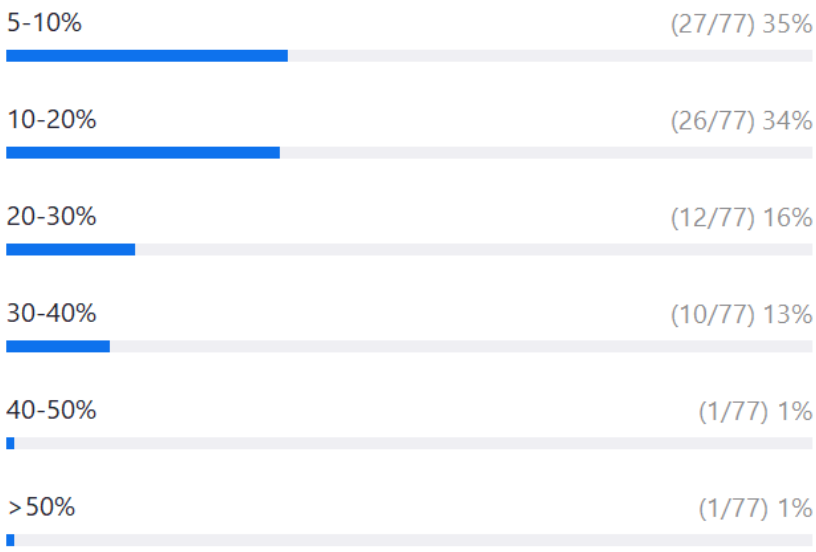
1. In the past 5, how often have you experienced yield losses due to cold damage (including fall and spring)? (Single Choice) *

79/79 (100%) answered



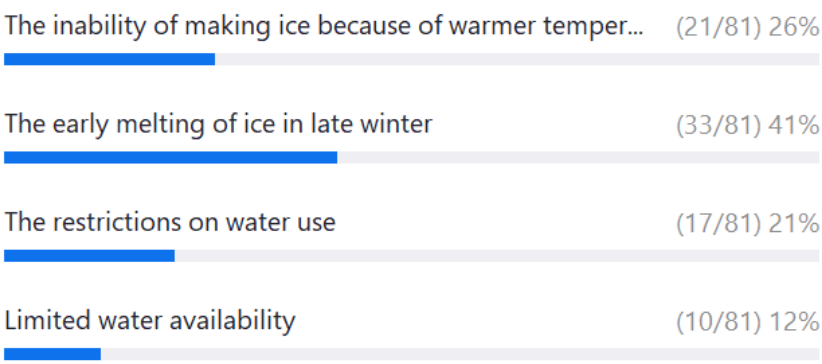
1. What would you estimate is the cost of protecting your vines from cold and frost is related to the overall production cost (this is for mature beds)? (Single Choice) *

77/77 (100%) answered



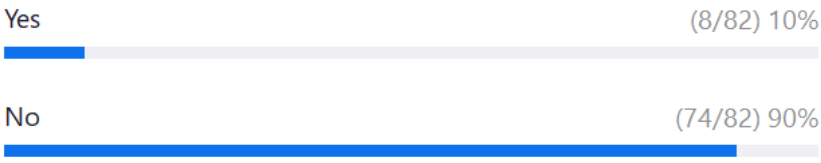
1. In the near future, what are you most concerned about regarding winter protection? (Single Choice) *

81/81 (100%) answered



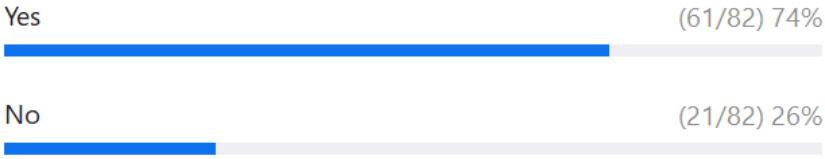
1. Do you track chilling hours? (Single Choice) *

82/82 (100%) answered



1. Would you be interested in using growing degree days for predicting plant development and fertilizer application? (Single Choice) *

82/82 (100%) answered



1. What kind of winter damage did you notice on your marsh? (Single Choice) *

80/80 (100%) answered

Leaf drop on edges of bed	(29/80) 36%
Leaf drop on entire bed	(15/80) 19%
None	(36/80) 45%

1. How concerned are you about cranberry false blossom? (Single Choice) *

82/82 (100%) answered

Very concerned	(11/82) 13%
Somewhat concerned	(49/82) 60%
Not at all concerned	(22/82) 27%

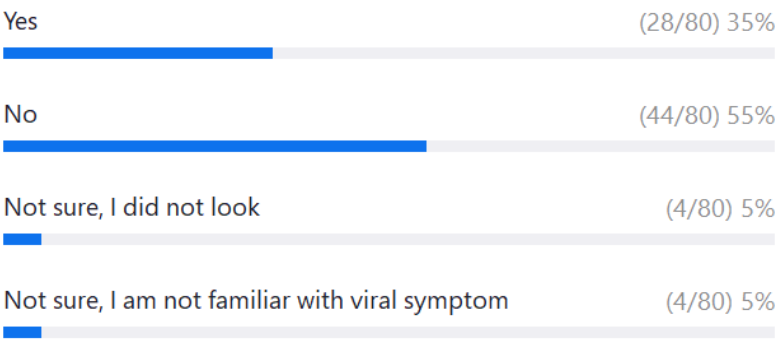
1. Did you observe cranberry false blossom symptoms at your march in 2021? (Single Choice) *

80/80 (100%) answered

Yes	(11/80) 14%
No	(49/80) 61%
Not sure, we do not scout for false blossom	(12/80) 15%
Not sure, I am not familiar with false blossom symptoms	(8/80) 10%

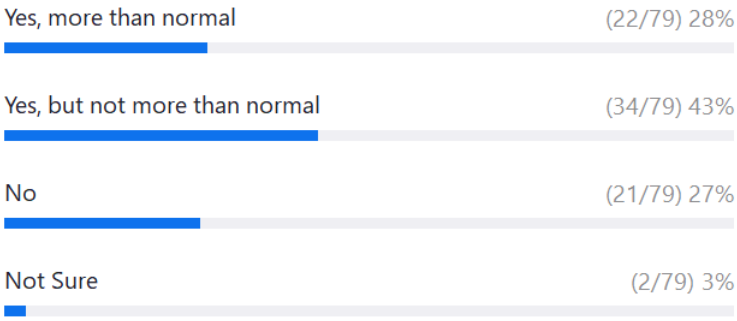
1. Did you observe virus symptoms (Blueberry Shock Virus or Tobacco Streak Virus) in your marsh in 2021? (Single Choice) *

80/80 (100%) answered



1. Did you experience losses to fruit rot in 2021? (Single Choice) *

79/79 (100%) answered



1. How many fungicide applications did you make in the 2021 growing season to control fruit rot? (Single Choice) *

76/76 (100%) answered

1. What do you feel contributed to increased fruit rot this season (if you saw increased fruit rot pressure)? (Single Choice) *

74/74 (100%) answered

Weather conditions (warm and wet season)	(31/74) 42%
Missed critical fungicide application timing	(3/74) 4%
Did not use fungicides for fruit rot control	(4/74) 5%
a and b	(3/74) 4%
a and c	(3/74) 4%

1. What fungicides did you use this season for fruit rot management? (Single Choice) *

75/75 (100%) answered

Abound + Indar	(33/75) 44%
Proline	(17/75) 23%
Quadris Top	(2/75) 3%
Other	(6/75) 8%
Did not use fungicides	(17/75) 23%

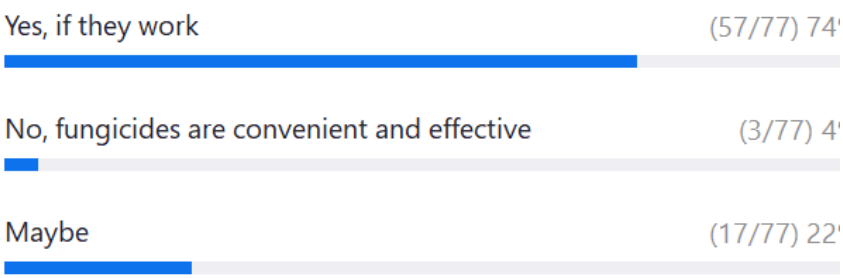
1. How do you establish a new bed at your marsh? (Single Choice) *

72/72 (100%) answered

Cuttings from an established bed	(59/72) 82%
Plants from a nursery	(13/72) 18%

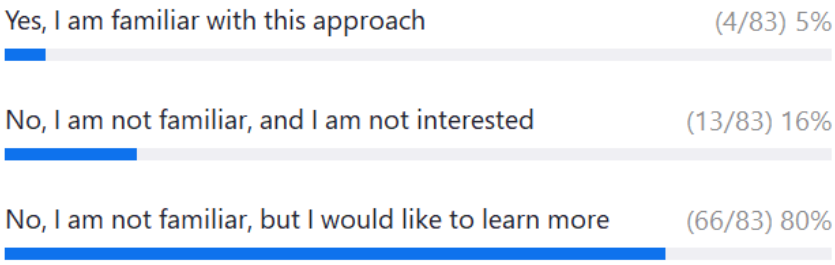
1. Would you consider alternative practices (ex. no fungicides) to manage fruit rot? (Single Choice) *

77/77 (100%) answered



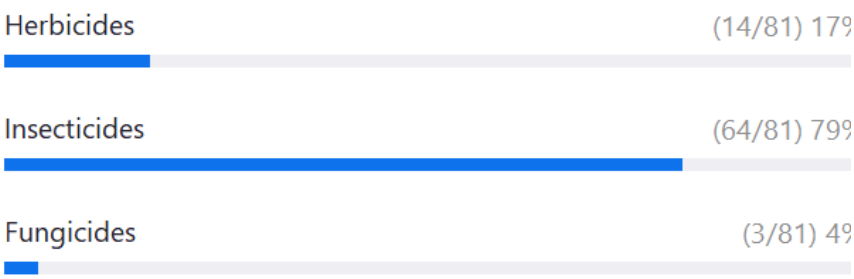
1. Are you familiar with heat or steam treatment practices used to sterilize planting material? These treatments are used in other perennial fruit cropping systems to reduce or eliminate pathogens in planting materials. (Single Choice) *

83/83 (100%) answered



1. Which pesticide type would you say is MOST needed on your marsh? In other words, if you could have just one pesticide type, which would it be? (Single Choice) *

81/81 (100%) answered



1. Do you have moss on your marsh? (Single Choice) *

74/74 (100%) answered

Yes, but only in a few beds;	(47/74) 64%
Yes, extensively across the marsh;	(11/74) 15%
No moss on my marsh!	(16/74) 22%

1. Do you feel that your weed pressure impacts cranberry yield? (Single Choice) *

76/76 (100%) answered

No impact	(15/76) 20%
Yes, by 10% or less	(53/76) 70%
Yes, by 11 to 25%	(7/76) 9%
Yes, by greater than 25%	(1/76) 1%

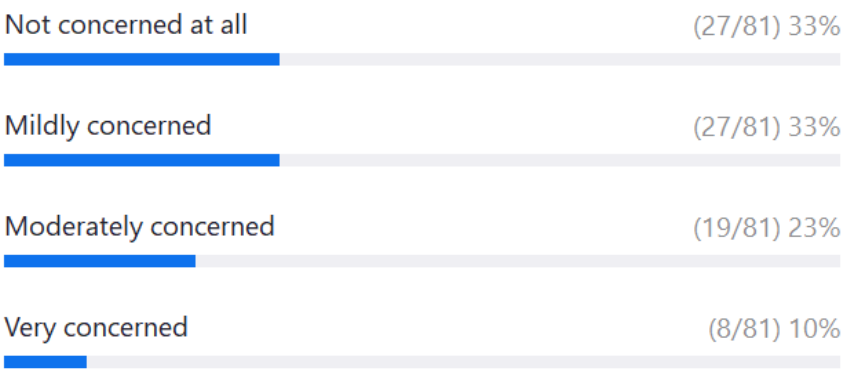
1. Do you use Casoron in your established beds: (Single Choice) *

78/78 (100%) answered

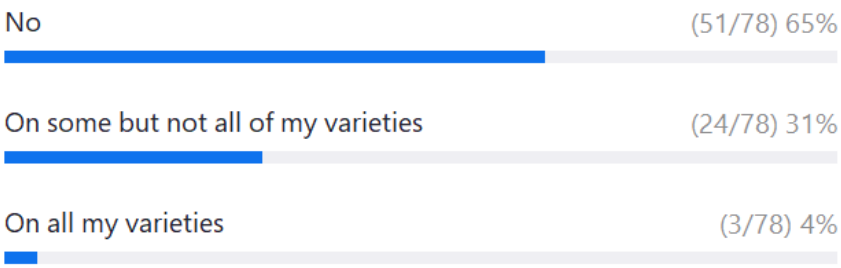
Yes, I use it every year	(42/78) 54%
Yes, but not every year	(30/78) 38%
No, I don't use Casoron	(6/78) 8%

1. How important is it to you that your herbicides control cranberry seedlings? (Single Choice) *

81/81 (100%) answered

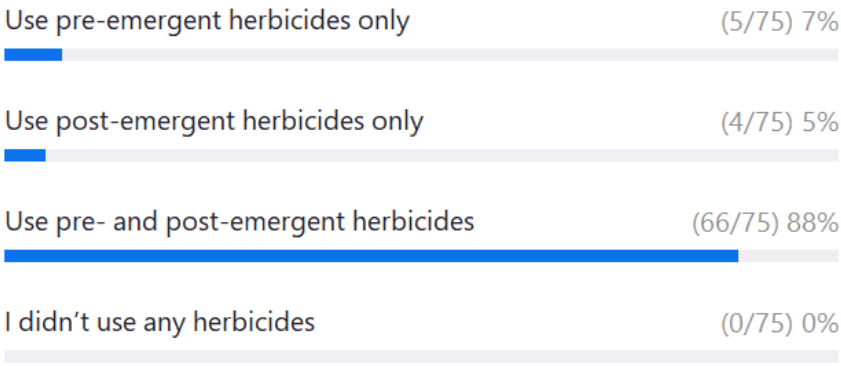


1. Have you had your varieties tested for purity in the past 5 years?



1. For your weed control program in 2021, did you: (Single Choice) *

75/75 (100%) answered



1. Do you use Stinger in your cranberries? (Single Choice) *

73/73 (100%) answered

Do you use Stinger in your cranberries?	(1/73) 1%
Yes, as a broadcast application	(16/73) 22%
No, I don't use Stinger	(56/73) 77%

1. When considering surfactants with your pesticides: (Single Choice) *

75/75 (100%) answered

I use the same surfactant product every year, if possible	(42/75) 56%
I use whatever the dealer delivers with the pesticide	(22/75) 29%
I'm not that concerned about which surfactant brand I...	(11/75) 15%

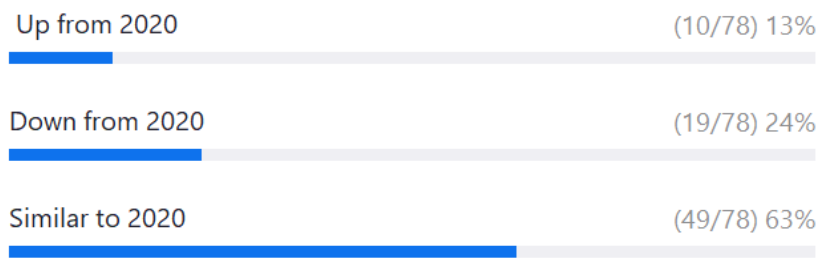
1. In 2021, we reduced these inputs: (Single Choice) *

75/75 (100%) answered

We didn't	(34/75) 45%
Number of bee hives	(2/75) 3%
Labor	(6/75) 8%
Fertilizers	(10/75) 13%
Pesticides (fungicides, insecticides, herbicides)	(6/75) 8%
More than one of the above	(17/75) 23%

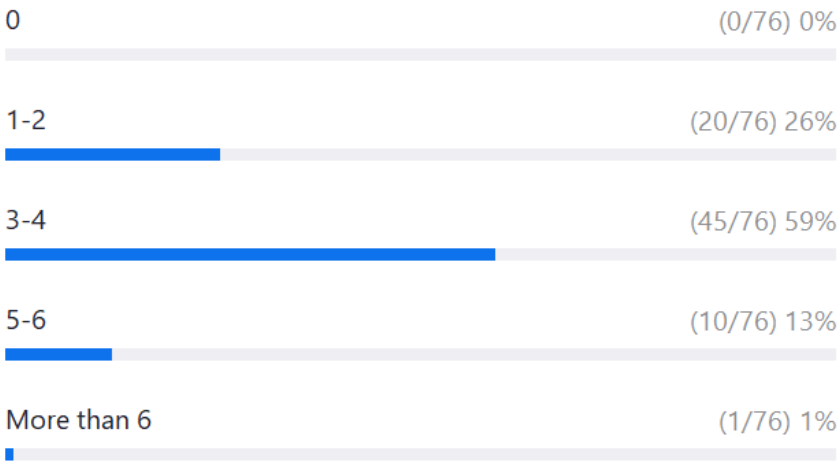
1. Was your insect pressure in 2021: (Single Choice) *

78/78 (100%) answered



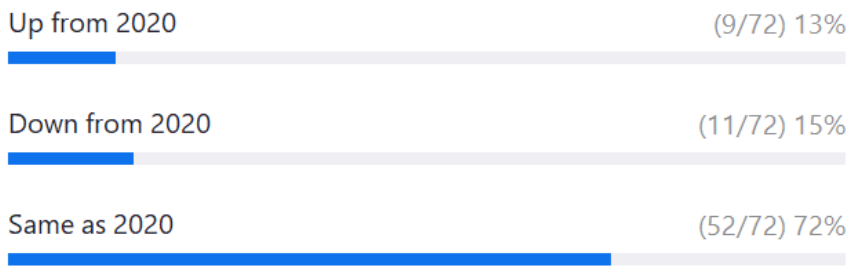
1. How many insecticide sprays did you apply in the 2021 growing season? (Single Choice) *

76/76 (100%) answered



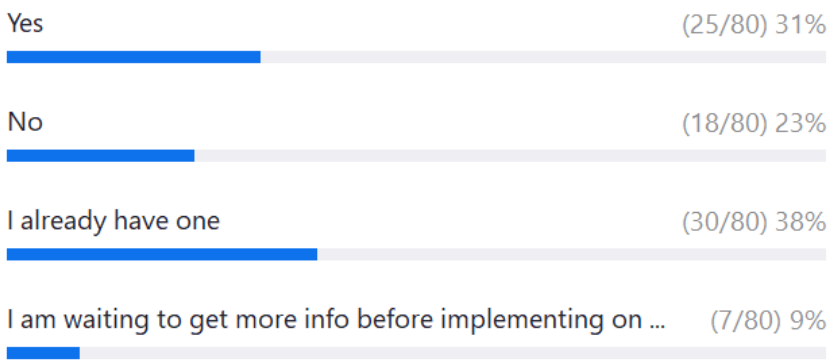
1. Was your number of insecticide sprays in 2021? (Single Choice) *

72/72 (100%) answered



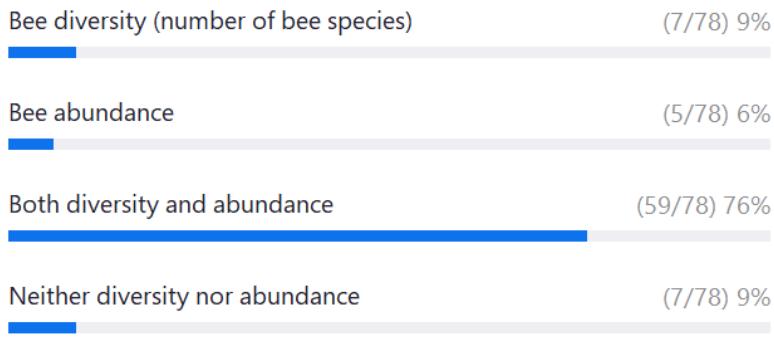
1. Are you considering planting a pollinator garden to attract wild pollinators on your marsh? (Single Choice) *

80/80 (100%) answered



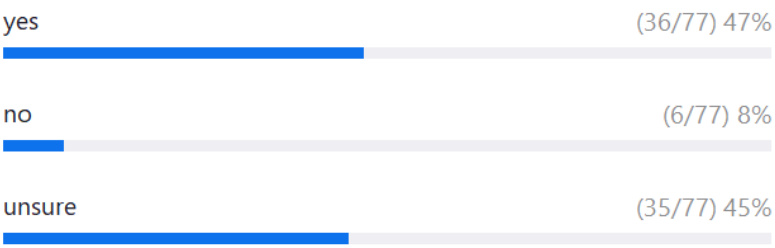
1. Pollinator gardens increase: (Single Choice) *

78/78 (100%) answered



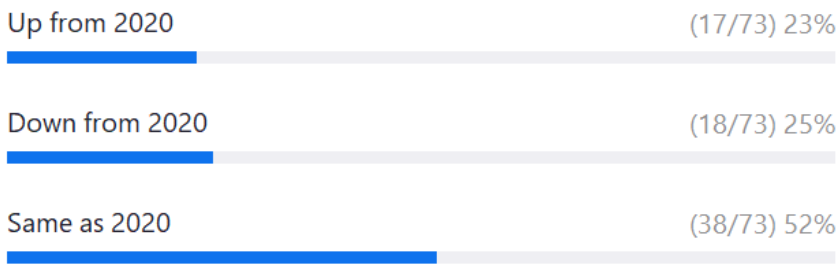
1. The increase in bee diversity and abundance associated with pollinator gardens results in an increase in cranberry yield: (Single Choice) *

77/77 (100%) answered



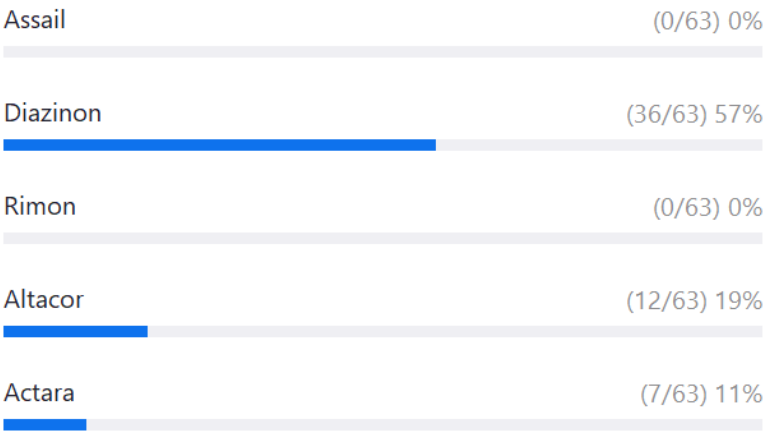
1. Was the flea beetle population on your marsh in 2021: (Single Choice) *

73/73 (100%) answered



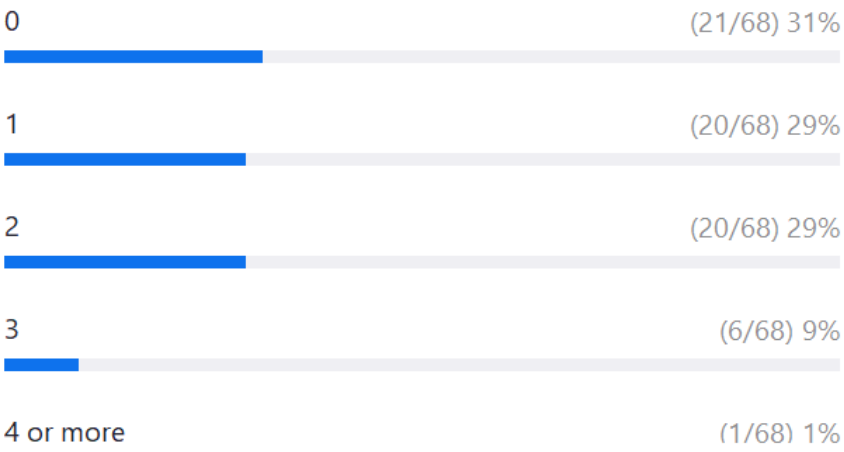
1. What insecticide did you use for flea beetle control in 2021? (Single Choice) *

63/63 (100%) answered



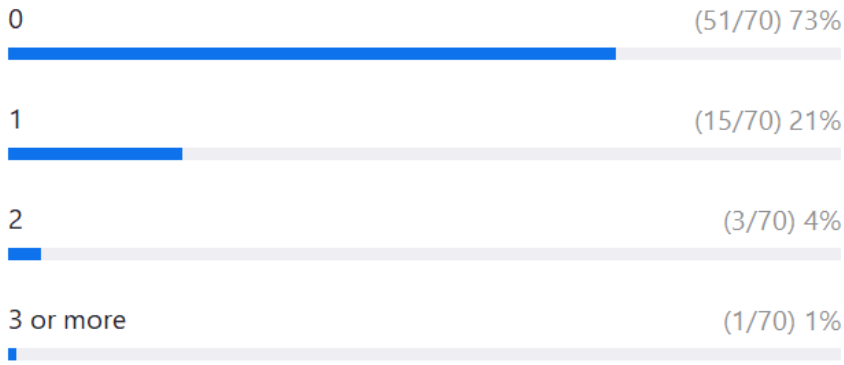
1. How many sprays did you apply specifically for flea beetle in 2021? (Single Choice) *

68/68 (100%) answered



1. How many times did you spray for leafhoppers in 2021? (Single Choice) *

70/70 (100%) answered



WISCONSIN STATE CRANBERRY GROWERS

Association

2021 Annual Report

WSCGA Annual Winter Meeting

January 19, 2022

Agenda

- **1:00 PM- Call to Order-**
  Steven Bartling, WSCGA President
- **Minutes from the 2021 Summer Meeting-**
  Mary Sawyer, WSCGA Secretary
- **Report of the President-**
  Steven Bartling, WSCGA President
- **Report of Committees**
- **Election of Directors-**
  Rocky Biegel, Chair, Board Development Committee
- **Other Business**
- **1:30 PM- Adjourn**

WSCGA Summer Meeting Minutes

August 11, 2021

Whittlesey Cranberry Co., Wisconsin Rapids, WI

The 2021 Wisconsin State Cranberry Growers Association Summer Meeting was called to order by President Steven Bartling on Wednesday - August 11, 2021 at 1:27 PM at Whittlesey Cranberry Co. in Wisconsin Rapids, Wisconsin. Bartling welcomed the growers in attendance and thanked the host families and staff. Bartling also thanked the WSCGA staff, including Tom Lochner, Alex Skawinski, Crystal Johnston, and Isaac Zarecki as well as the WSCGA Education Committee and Associate Member Committee members for coordinating the Summer Field Day event.

Secretary's Report – Bartling referred to the 2021 Virtual Winter Meeting Minutes printed on page 54 in the Summer Field Day Meeting Program Book. Rocky Biegel moved and Jim Bible seconded a motion to approve the January 27, 2021 meeting minutes as printed. Motion carried.

Special Guests – Bartling introduced the Field Day and Summer Meeting special guests, including:

- Representative Nancy VanderMeer

Marsh Recognition – Each year at the Field Day event, the WSCGA recognizes milestone marsh anniversaries of grower members. Bartling presented a recognition plaque for each of the following marshes:

- Whittlesey Cranberry Company, Inc.- 150th Anniversary, accepted by Robert Detlefsen
- Potter Cranberry Company- 150th Anniversary, accepted by Jack Potter
- Scott Cranberry Marsh, Inc.- 100th Anniversary, not present
- Rezin Berries, LLC- 75th Anniversary, accepted by Chris Rezin
- Vilas Cranberry Co., Inc.- 75th Anniversary, not present
- Krabb Hill Cranberries, LLC- 25th Anniversary, accepted by Nate Brockman
- Lynn Hill Cranberry, LLC- 25th Anniversary, not present
- Twin Lake Cranberry, LLC- 25th Anniversary, accepted by Dan Tritz
- Wisconsin River Cranberry Co.- 25th Anniversary, not present

Bartling also presented a Summer Field Day Host plaque for Whittlesey Cranberry Co. and expressed the Association's appreciation and gratefulness for their efforts to host the event. Robert Detlefsen made brief remarks and accepted the plaque on behalf of Whittlesey Cranberry Co.

President's Report – None

Executive Director's Report – None

Old Business – None

New Business – None

Adjourn – There being no further business, the Bartling entertained a motion to adjourn. Robert Detlefsen made a motion to adjourn the meeting. Kris Parker seconded the motion. All were in favor and motion carried. The Summer Meeting was adjourned at 1:45 pm.

Announcements

- The WCREF Sporting Clay Shoot is coming up on August 27, 2021
- The 2022 WSCGA Annual Summer Meeting, Field Day & Trade Show will be held at the Wisconsin Cranberry Research Station at Robinson Creek.

Respectfully submitted,
Alex Skawinski on behalf of Mary Sawyer – WSCGA Secretary

From the President

Taking the time to reflect on the past year is an important exercise- what went well, what didn't go as expected, as well as what can we learn from and improve for the future.

2021 seemed to be a year of evolutions for myself, the grower community and the WSCGA in many ways. We learned the values and struggles of a swift dive into virtual meetings and gatherings brought on by the Covid pandemic. We learned the value of having a strong strategic plan to help keep us on track for what we intended to accomplish. Having the strategic plan in place allowed us to stay on course as we had to drastically change how we achieved our goals. We saw the corona virus sneak into our communities and lives, impacting all of us all to some extent, be it directly or indirectly. We saw new faces in our cranberry community and welcomed the excitement that their energy will bring. We said goodbye to people as they retired from their involvement over the years.

After all the dynamic forces of the last couple of years, I strongly feel that our cranberry community is on a good path forward. But the evolutions are just beginning. We have reached the point of the 2018 industry-wide strategic plan where we need to reassess for the next 3-5 years, as we have completed most of the goals set out. This is a great accomplishment and impeccably timed. Over the winter months of 2021-22, the Association leadership will set forth a process to update the WSCGA strategic plan by engaging the grower community for feedback. The other big task I foresee the leadership working on is evaluating the funding model of the Association and changing as necessary to be a modern structure.

The current support in the community for the Association is very high. This is one of the most powerful things our state industry does in the favor of our farmers. We have a very connected and engaged cranberry community. This is a big point of difference to other agricultural sectors. I feel this is the most valued aspect of what has gotten us to where we are today and will continue to be true for the future.

I am very excited to see what the new advancements, programs, and people will start to bring to us over the coming years.

From the Executive Director

We enter 2022 with a great deal of activity on behalf of the WSCGA membership in our three program areas - Public Policy, Education and Communications. WSCGA is completing work on a strategic plan for each of these programs for the next three years. In 2018 we adopted a plan to transform and restructure the WSCGA along with the WCB and WCREF. These changes clarified missions and program responsibilities for the three grower groups. We are now looking at upgrading and evaluating programs under these new structures.

The changes were subtle and included restructuring our committees, adding some, consolidating the work of others and setting aside committees that were no longer needed. We provided each committee with updated charters and strategic objectives for the development of programming based on the grower/members responses to the surveys. Board members were named as chair of each committee to provide improved communications between the Board and each of the program areas.

We also restructured the staff to assign each committee a staff person to coordinate their activities. Having staff and the volunteers working more closely together has been a great success in making sure our programs are aligned with our member interests and priorities.

This has all taken leadership from your Boards of Directors. All three boards - WSCGA, WCB and WCREF have been active in looking at long-term strategic needs while also working closely on projects and programs for the short term. We want to ensure that these activities are consistent with the long-range strategic plans and grower priorities.

I have been fortunate over the past 32 years to work with outstanding grower leadership. Today I can say that we have some of the most active and involved leadership at all levels of the organizations. We carry on the tradition of grower leaders stepping up to take on important roles for the industry. The next generation of growers is enthusiastic and passionate about growing cranberries. They want to tell their story and make sure that public policy is developed to enhance their ability to sustainably grow their crops. They also are eager to learn about new technologies and adopt new practices that improve their ability to farm.

We will always face challenges to our farming practices. Water will continue to be the biggest issue we face. We are well positioned with plans and strategies to address the issue and demonstrate our commitment to protecting this valuable resource.

Thank you to everyone who has made this past year a success. We look forward to achieving greater successes in 2022.

WSCGA Annual Report

The Wisconsin State Cranberry Growers Association was formed in 1887 to serve the state's newly emerging cranberry industry. Some 135 years later, the organization continues to work to meet its mission of providing quality programs for members to enable the industry to prosper.

WSCGA is organized as a non-profit, non-stock corporation governed by a nine-member Board of Directors. The Board is advised by a number of committees and working groups on topics ranging from Public Policy to Promotion to Grower and Public Education. The Association employs professional staff and consultants. The Board, committees, staff and consultants work together as a team to develop and implement programs and policy for the organization.

The 2021 Annual Report highlights activities by the Association on behalf of its membership throughout the course of the year. These successes are due to the hard work of the grower and associate members who volunteer their time and talent to work with the Association's professional staff and contractors to advance the mission of the organization. We hope all growers and members of the industry will thank those who continue to work on their behalf and to join the WSCGA in these efforts.

WSCGA Service to Industry Award

The WSCGA Board of Directors presents the Service to Industry Award to individuals or groups who have provided outstanding service to the industry and Association. The award is the highest recognition that the WSCGA provides. This year the Association is pleased to provide recognition to Kathryn VandenBosch, dean of the UW-Madison College of Agricultural and Life Sciences, and Dr. Nicholi Vorsa, professor of plant biology at Rutgers University.

Kathryn VandenBosch

Kathryn VandenBosch has been dean of the UW-Madison College of Agricultural and Life Sciences from 2012 to 2022. Prior to that, VandenBosch was a professor of plant biology at the University of Minnesota in St. Paul. In 2001, she became head of the plant biology department there, but took a brief hiatus in 2006 to serve as interim dean of the newly formed College of Food, Agricultural and Natural Resource Sciences. She also served as a member and former chair of the executive committees of both the Faculty Senate and the University Senate.

VandenBosch's research focused on the genetics of plant-microbe interactions and nitrogen fixation in legumes, a family that includes several agriculturally important species. In 2009, VandenBosch was named a fellow of the American Society of Plant Biologists.

Prior to her tenure at the University of Minnesota, VandenBosch was a faculty member at Texas A&M University for 12 years. She holds M.S. and Ph.D. degrees in botany from the University of Massachusetts Amherst, and spent time at both UW-Madison and the John Innes Institute in Great Britain as a postdoctoral associate.

Dr. Nicholi Vorsa

Dr. Nicholi Vorsa, 'Nick', received a BS in Plant Science from Rutgers University (1976), a MS degree in Plant Breeding and Genetics from University of Wisconsin-Madison (1978), and a PhD in Horticulture-Plant Breeding from Rutgers University (1985). Joining Rutgers as an Assistant Professor in 1985 he is currently Professor of Plant Biology in the School of Environmental and Biological Sciences, Rutgers University. He was Director of the Rutgers PE Marucci Center for Blueberry and Cranberry Research and Extension, New Jersey Agricultural Experiment Station, in Chatsworth, New Jersey from 1988 to 2021. Dr. Vorsa's two major areas of research interest are genetic enhancement of blueberry and cranberry through breeding and the study of natural products, particularly the polyphenols, i.e., anti-oxidants, of cranberry in relation to human health. He has collected and utilized diverse germplasm, i.e., gene pool, in his breeding program to improve yield, insect and disease resistance, and phytonutrient content for these two native North America crop species. He developed the first DNA fingerprinting technology in cranberry to facilitate the unambiguous discrimination of cranberry varieties and has published extensively on cranberry genetics including publishing the first genetic map of cranberry and low acid genes found in the germplasm. His program focus areas includes cranberry genomics, genetics of phytochemicals, fruit rot resistance breeding, fruit chemistry and phytonutrient bioavailability. He has released seven US patented cranberry cultivars with six Canadian Plant Breeders' Grant of Rights. His cranberry varieties have received wide acceptance in the US, Canada and Chile. He has over 150 publications in scientific journals and book chapters.

WSCGA Advocate Awards in Major Program Areas

In 2021 the WSCGA Board of Directors created additional recognition for members who have provided leadership and support in our major program areas. The Board is proud to present these awards to the following individuals who have stepped up this year in the areas of Public Policy, Education, Communications and Research. The Board has also selected an Associate Member to recognize for their support this year.

Public Policy Advocate - Jessi Rezin, Cutler Cranberry

Jessica Rezin grew up living and working on her family's cranberry marsh and is starting her 19th year working at Cutler Cranberry Company. She lives outside Warrens with her husband Matt and their children, Grace and Bruce, on Matt's family-owned cranberry marsh.

Jessica received her B.S. in Agricultural and Applied Economics from UW-Madison in 1998, and completed her MBA in Agribusiness and Entrepreneurship in December 2000. Following graduation, she managed the Wisconsin Cranberry Discovery Center in Warrens before returning to work at Cutler Cranberry Company. She served on the Cranberry Marketing Committee for 14 years, and currently serves on the WSCGA Public Relations committee and is a member of the Ocean Spray Grower Council.

Education Advocate - Allison Jonjak, Cranberry Outreach Specialist, UW-Madison Division of Extension

Growing up on a cranberry farm in Sawyer County, the cranberry industry has always been the focus of Allison's drive for knowledge and efficiency. After bachelor's and master's degrees in Agricultural Engineering focusing on soil physics and soil chemistry, Allison worked as Precision Ag Analyst for row crop farmers, until the opportunity to return to Wisconsin and the Cranberry industry arose. She is proud to be able to apply her technical agronomic skills, her data skills, and her education skills to keep tight the feedback loops between growers and researchers at the University of Wisconsin. Growers motivating research and researchers' work being applied on growers' marshes lets Allison know her work is useful to the industry.

Communications Advocate - Rooted In Red

Rooted in Red at Dempze Cranberry Co is a storefront and event space located on a fifth-generation cranberry farm in Wisconsin Rapids connecting community to local agriculture, run by Jamie Biegel and daughter Rochelle Hoffman.

Researcher of the Year - Amaya Atucha, assistant professor Department of Horticulture and Fruit Crop Extension Specialist, UW-Madison

Amaya Atucha is an associate professor and the Gottschalk Endowed Chair for Cranberry Research in the department of Horticulture at the University of Wisconsin-Madison. Her research program focuses on crop physiology and production of small fruit and cold climate viticulture. The goal of her extension program is to generate and provide research-based information that improves crop production and profitability of the Wisconsin fruit industry.

Associate Member of the Year - Mid-State Truck Service, Inc.

On September 1, 1965, Frank Vandehey became an authorized International Truck Dealer in Marshfield, WI. Shortly after, the profile grew to add IC Bus and Idealease. Over the years, the business continued to grow which resulted in adding several more locations. After leading the company for 34 years, Frank retired in 1999 leaving the ownership to his two sons, Jon and Tom Vandehey. Being a second generation, family-owned company, Jon and Tom followed in their father's footsteps to expand the business to now 8 locations expanding from Central Wisconsin to Northeast Minnesota. As a family and a company, Mid-State values the communities they serve and continues to give back to them year after year. Due to the long-standing dedication Mid-State Truck Service has provided to their customers over the decades, they have become the premier transportation industry service provider they are today.

MID-STATE
TRUCK SERVICE, INC.

The Team – WSCGA Board of Directors 2021

Steven Bartling, President

Steven and his family own and operate Bartling's Manitowish Cranberry in Manitowish Waters. Steven is the WSCGA President, and serves on the Executive, Education, and Research Committees, as well as the Technology Subcommittee. He also worked as the WSCGA representative on the Strategic Planning Committee. Steven participated in the inaugural class of the Wisconsin Cranberry Leadership Development Program in 2012-13 and was elected to the Board in 2016.

Rocky Biegel, Vice President

Rocky Biegel is part of Dempze Cranberry Co. in Wisconsin Rapids and King Cranberries LLC in Augusta. Rocky joined the Board in 2017 and became the WSCGA Vice President in 2020. Rocky serves on the Executive, Board Development and Education Committees.

Mary Sawyer, Secretary

Mary is part of Saratoga Cranberry in Wisconsin Rapids. Mary was elected to the Board of Directors in 2020 and serves as the WSCGA Secretary. Mary also serves on the Executive, Board Development and Public Relations Committees. Mary participated in the inaugural class of the Wisconsin Cranberry Leadership Development Program in 2012-13.

Jenna Van Wychen - Treasurer

Jenna joined the Board in 2017. Jenna is part of Van Kow Cranberries and Wetherby Cranberry in Monroe County. Jenna is the WSCGA Treasurer and chairs the Associate Member Committee. Jenna also serves on the Executive Committee and participated in the 2013-14 Wisconsin Cranberry Leadership Development Program.

Jim Bible

Jim is part of Brockway Cranberry and Rock Creek Cranberry in Black River Falls. Jim was elected to the Board in 2020 and serves as chair of the Education Committee.

Mike Bretl

Mike serves as the Wisconsin Region Manager for Manulife Investment Management- Farmland Management Services, based out of Wisconsin Rapids. Mike joined the Board in 2019 and is the chair of the Research Committee. He also serves on the Board Development Committee and took part in the inaugural class of the Wisconsin Cranberry Leadership Development Program, in 2012-13. Mike earned the Accredited Farm Manager designation from the American Society of Farm Managers and Rural Appraisers in 2017. In 2018, he became a Wisconsin Certified Crop Advisor and Sustainability Specialist, qualified through the American Society of Agronomy.

Kris Parker

Kris is the Project Manager at Cranberry Creek Cranberries in Necedah. Kris was appointed to the Board of Directors in 2020 to fill the remainder of a vacant seat. Kris participated in the 2013-14 Wisconsin Cranberry Leadership Development Program and serves on the Education Committee.

Karl Pippenger

Karl is part of the team at Cranberry Lake Cranberries in Phillips and owns and operates his own small cranberry marsh, "Pip's Cranberries". He participated in the 2013-14 Wisconsin Cranberry Leadership Development Program. Karl joined the Board in 2015 and serves as the chair of the Public Policy Committee.

Rusty Schultz

Rusty joined the Board in 2018 and is part of Russell Rezin & Son and Jay Creek Cranberries in Monroe County. He participated in the inaugural class of the Wisconsin Cranberry Leadership Development Program in 2012-13. Rusty is the chair of the Public Relations Committee.

WSCGA Committees

Executive Committee

Charge: The Committee is delegated certain Board authorities to act between Board meetings and to provide strategic direction for the Board related to the operation, finances, and structure of the WSCGA.

Steven Bartling, President
Rocky Biegel, Vice President
Mary Sawyer, Secretary
Jenna Van Wychen, Treasurer
Bill Hatch
Mark Mahoney

Public Policy Committee

Charge: The Committee is responsible for the development of recommendations on policy related to issues and state, federal regulatory and legislative actions that arise as part of the public policy advocacy program. The committee works to mobilize growers on issues to implement policy and works to develop relationships with elected officials to help them understand the concerns of Wisconsin cranberry growers.

Karl Pippenger- Chair
Asa Bennett
Amber Bristow
Stephen Brown
Jenna Dempze
Karen Doers
Fawn Gottschalk
David Hansen
Nicole Hansen
Bill Hatch
Leroy Kummer
Andy Reitz
Seth Rice
Doug Rifleman
Russ Rifleman
Ben Ryner
Scott Schultz
Craige Scott

Education Committee

Charge: The main emphasis of the WSCGA mission is education, both for growers and the general public on cranberry growing. A large portion of this responsibility is assigned to the Education Committee, making it one of the key committees in the Association. The committee meets with UW Extension faculty and others during the year to review and plan the various education programs for the Association including the Wisconsin Cranberry School, early season workshops and the Summer Meeting and Field Day.

Jim Bible- Chair
Christelle Guedot- Cranberry School Program Chair
Steven Bartling
Steph Bennett
Rocky Biegel
Jim Bielmeier
Alex Billman
Jeremy Eichhorn
Steve Hahn
Nicole Hansen
Jason Hatch
Allison Jonjak
Christina Maley
John Moss
Kris Parker
Andy Reitz
Russ Sawyer
Jayne Sojka
Pam Verhulst

Technology Committee

Charge: The Technology Subcommittee is a subset of the Education Committee. The subcommittee is tasked with assisting the Board of Directors and WSCGA Committees on an as-needed basis in matters such as information technology, adoption of new technologies by the industry, identifying solutions to the technological needs of the Association, etc.

John Moss – Chair
Steven Bartling
Russ Sawyer
Pam Verhulst

Public Relations Committee

Charge: The Public Relations Committee is responsible for development and implementation of the communications plan for the Association. The objectives of the communications program of the WSCGA are twofold. First, to promote the general knowledge of cranberry growing in Wisconsin to enhance the image of growers and the industry; second, to inform consumers and the public about cranberries and cranberry products to enhance and promote the consumption of fruit and increase overall demand for cranberry products.

Rusty Schultz– Chair
Amber Bristow
Robert Detlefsen
Jeremy Eichhorn
Amy Gebhardt
Mike Gnewikow
Fawn Gottschalk
Rochelle Hoffman
Leroy Kummer
Gabriella Liddane
Beth Oemichen
Jessica Rezin
Greg Schwartz
Mary Sawyer
Nodji Van Wychen

Research Committee

Charge: The Board of Directors established the committee to provide growers with a forum to discuss research needs with University of Wisconsin research faculty and the cranberry research community on a national basis. The committee works cooperatively with the Wisconsin Cranberry Board, Inc. (WCB), The Cranberry Institute (CI), and others to identify grower research needs, coordinate projects to avoid duplication, and to help establish priorities.

Mike Bretl – Chair
Suzanne Arendt
Steven Bartling
Alex Billman
Amber Bristow
Stephen Brown
Robert Detlefsen
Mike Gnewikow
Fawn Gottschalk
Ed Grygleski
Jeff Habelman
Nicole Hansen
Rochelle Hoffman
David Jones
Gabriella Liddane
Mark Mahoney
John Moss
Doug Rifleman
Ben Ryner
Dustin Sawyer
Mary Sawyer
Russ Sawyer
Scott Schultz
Jayne Sojka
Pam Verhulst
Bill Wolfe

Associate Member Committee

Charge: The Associate Member Committee provides input on WSCGA Associate Membership benefits, Summer and Winter Trade Shows, NEWS advertising, Program Book & Buyers Guide publication advertising, sponsorships, mailings and evaluations.

Jenna Van Wychen - Chair
Tom Altmann
Amy Boson
Derek Johnson
Casey Koback
Dawn Ruiter
Nicki Anderson
Jay Weidman

Board Development Committee

Charge: The Board Development Committee functions to identify paths of leadership for potential leaders and develop their skills. The Committee is responsible for Board recruitment, orientation, Board and director self-assessment, continuing education, and Board management in addition to serving as the Nominating Committee

Rocky Biegel, Chair
Mike Bretl
Mary Sawyer

WSCGA Staff

Tom Lochner, Executive Director

Tom Lochner was named the first WSCGA Executive Director in 1988. Since then, the association has grown into a well-respected voice for the Wisconsin cranberry grower. The Association expanded its education, communications, and public policy programs. It took on the responsibility of providing administrative services to the Wisconsin Cranberry Board, Inc. to enable it to implement its research, education, and promotion programs in a cost-efficient manner. In 2004 the WSCGA also assisted the Cranberry Museum, Inc. develop and operate the Wisconsin Cranberry Discovery Center in the Village of Warrens. Most recently, WSCGA has provided administrative services to the Wisconsin Cranberry Research and Education Foundation for its effort to establish a research station for cranberries in Wisconsin.

As the chief staff person, Tom serves as the lead spokesman for the organization and represents WSCGA in interactions with University Research and Extension faculty and administration, as well as with Federal, State, and local governmental organizations. He is also responsible for coordinating the activities of staff and various consultants who assist with communications and public policy programs. He serves as a liaison with industry groups, such as the Cranberry Institute and the US Cranberry Marketing Committee.

Over the course of his career, Tom has worked with the Board and committees on growing the programs and membership of the Association. He believes in a team approach to program planning and development. This approach has resulted in active committees, an engaged and high performing Board, and high grower participation in WSCGA programs.

Alex Skawinski

Alex Skawinski joined WSCGA in December 2015. In 2019, following the strategic planning project, Alex shifted into the role of Member Education and Communications Manager. In this role, she continues her duties as administrative assistant, but also leads education and communication programs for the Association aimed at improving grower practices, knowledge, and activities of the organization.

In her role as administrative assistant, she prepares materials and maintains records for Board and Committee meetings, develops and implements Associate Member programs, and works with the WCREF Development Fund Committee to plan and hold the annual Cranberry Open Golf Outing and the Sporting Clay Shoot. She also provides administrative support to the Wisconsin Cranberry Research and Education Foundation and the Wisconsin Cranberry Board, Inc.

In her role as Member Education and Communications Manager, Alex works with the Executive Director, the Education Committee, and the Associate Member Committee to develop and implement industry education and communication plans. She also manages membership benefits, programming, and education, as well as develops content for and manages the membership side of the wiscran.org website, coordinates the publication of WSCGA publications and maintains the Association's Oral History Project.

Crystal Johnston

Cris joined the staff at WSCGA in 2005 as a part time bookkeeper. Her main responsibility is to keep the financial records for the Association. Cris has additional responsibilities as Clerical Assistant managing the databases for the membership, serving as back-up for staff support, assisting at meetings and WSCGA events, and serves as the office manager in purchasing supplies and equipment for the Association. In 2018, Cris became a Wisconsin Notary Public.

Additionally, she manages the assessment forms, filings, and bookkeeping for the Wisconsin Cranberry Board, Inc. Cris provides administrative support and bookkeeping to the Wisconsin Cranberry Research and Education Foundation.

Isaac Zarecki
Isaac joined the WSCGA in September 2019 in the new role of Public Education and Communications Manager. The association reorganized staff duties as part of the implementation of the strategic plan adopted in 2018. In the plan, growers supported increased communication and public relations efforts as well as continuation of the quality education programming provided by WSCGA. The new staffing structure is designed to accomplish these goals.

Isaac leads the WSCGA communication and promotion programs aimed at educating the public about cranberry growing in Wisconsin, maintaining a strong reputation for the industry, and promoting the consumption of Wisconsin cranberries. He joined WSCGA after serving as an editor of a local newspaper in Hot Springs, South Dakota.

In this role, Isaac works with the Executive Director and Public Relations Committee to develop an industry public relations and communications plan as well as implementing the plan, including various communications, and marketing initiatives. He also develops content for and manages the wiscran.org website and the Wisconsin Cranberries social media channels content and strategic ad program, writes and edits various communications materials, including newsletter articles, annual reports, news releases, pitch letters, talking points, articles, and blog posts.

In addition, Isaac conducts media relations efforts on behalf of industry, including managing reactive and proactive news opportunities as well as managing WSCGA's partnership/sponsorship program, including logistics and contract negotiations. He also coordinates and markets the Made with Wisconsin Cranberries program.

Association Consultants

Dewitt, LLP is a full-service law firm based in Madison, WI. DeWitt has experienced attorneys in virtually all areas of law practice and has offices in Brookfield, Madison and Minneapolis, Minnesota.

The DeWitt Government Relations team is led by **Attorney Jordan Lamb**, a partner in the Madison office, who also serves as WSCGA's legislative counsel. **Jordan Lamb's** expertise in environmental regulation is a particular asset to WSCGA and our members, as they navigate the interplay between state and federal regulations and running a successful business. She is a consistent and trusted voice for us in the development and current rewrite of the State non-point source pollution program in NR 151 and ATCP 50. In prior legislative sessions, she played a key role in Wetland Reform Legislation, the development of a protocol for dealing with cranberry floodplain and consistently provides leadership on issues related to groundwater, drainage, artificial and navigable water bodies and business issues that affect our members.

Laughlin Constable, Communications and Public Relations

Laughlin Constable (LC) is a multi-faceted and full-service agency. The LC team is made up of a group of talented and creative public relations professionals with a wide variety of backgrounds. LC provides access to expertise for communications, public relations, advertising, influencer marketing and social media programs for WSCGA and its members and partners.

Kris Naidl, APR, began working with WSCGA in 1994 and she has assisted the cranberry industry with a number of efforts, including strategic communications work to affect change in state regulations, branding, publicity and media relations, issues management, digital strategy and more. She heads up LC's PR team and has earned her national accreditation from the Public Relations Society of America (PRSA). Kris and the LC team have been honored on numerous occasions by PRSA for its communications work to support Wisconsin's cranberry industry.

Katie Whitlock, APR, has worked with WSCGA for more than 5 years, assisting the industry with communication efforts, including strategic planning, public opinion research, media relations, issues management, event and sponsorship coordination, crisis communications, social media and more. She has earned her national accreditation from the Public Relations Society of America (PRSA).

WSCGA Program Activities

Public Policy Advocacy

WSCGA Public Policy Advocacy Program Overview

Policy Statement of WSCGA Public Policy Advocacy Program
The WSCGA's Public Policy Advocacy Program strives for state and federal legislative outcomes that allow Wisconsin growers to farm in an environmentally and economically sustainable manner. The position statements and activities of the Public Policy Program are weighed against this goal:

> Wisconsin cranberry growers support legislation, rules and policies that balance the conservation of important natural resources and the stewardship of resources by growers against the economic needs and benefits of cranberry growing in Wisconsin.

The following are priority areas for the WSCGA Public Policy Advocacy Program:

Environmental Policy and Regulation
The greatest threats – and opportunities – for the industry in public policy are in the area of environmental regulation. Whether it pertains to water access and quality, wetlands, or the chemicals for crop production that growers use, WSCGA members expect their Association to represent their interests.

Water Access
An abundant and high-quality water supply is the key to the success of cranberry growing in Wisconsin. As such, the highest priority for the WSCGA is to maintain and protect growers' ability to access surface and groundwater for their farming operations. Conducting normal farming operations to maintain and enhance water use and conservation must be protected and must continue to be allowed with limited regulation.

Water Quality
Cranberry farming practices face increasing scrutiny as to their impacts on water quality. WSCGA has led efforts with UWEX, USDA NRCS, DNR and DATCP to address Best Management Practices to protect water quality. Maintaining the definition of return flow from irrigated agriculture as a non-point source is a priority for the WSCGA. Changes to the state water regulatory program need continuous monitoring. TMDL development for cranberry waters and the Statewide Nutrient Management Strategy are also priorities for WSCGA.

Federal/State Linkage
In many cases with environmental regulation, there is a strong and important relationship between Wisconsin and federal laws and regulation. This is the case with the Clean Water Act and floodplain regulation. As changes take place in federal programs, they impact the state as the delegated authority to administer those programs. At the same time, attempts to reform or revise state regulatory programs require federal approval. WSCGA and its Legislative Counsel continue to be vigilant in these areas.

With these identified priorities, WSCGA staff and leadership will closely communicate with the WSCGA Legislative Counsel to evaluate issues as they arise, assess risk and threats to the industry, and then determine the level of activity that is required to meet the organization's goal and mission.

Federal Legislative Update

The WSCGA maintains a targeted Federal Legislative program that has developed a working relationship with all of the members of the Wisconsin Congressional Delegation. Bill Broydrick assisted the Association in these efforts which resulted in major benefits to growers this past year and a half.

The Association also worked with the WCREF to secure additional funding for the USDA ARS Cranberry Research Program in Wisconsin. These funds were used to create a new Food Science position, add a Cranberry Plant Physiologist and to enhance the operation of the Research Station. Additional support was also provided to the Genetics and Genomics program as well as the Entomology Program.

The Association also works with other grower and handler groups on issues such as pesticide registrations, MRLs, research funding and USDA purchases.

State Legislative Update

By Jordan Lamb, DeWitt LLP

Attorney Jordan Lamb from DeWitt law firm in Madison, serves as the WSCGA's lead legal and legislative counsel. Successful management of governmental issues for the WSCGA depends on our comprehensive approach to the unique challenges ranging from environmental to business issues that are faced by Wisconsin cranberry growers. Our approach to each issue depends on a combination of legal analysis, statute and rule design, constituency involvement, political action and media management.

The Wisconsin State Legislature is currently "in session" until sometime in the early spring of 2022 when they will adjourn and focus on the 2022 elections. They have been in session since January 4, 2021. The following are the issues that our state advocacy team have been working on over the past twelve months.

WSCGA State Legislative Successes in 2021:

- UW State Specialists Teaching Hours (ENACTED - 2021 WI Act 11). Sen. Howard Marklein (R- Spring Green) and Rep. Amy Loudenbeck (R-Clinton) introduced a bill to support applied agricultural research in Wisconsin. Wisconsin farmers rely on a select group of agricultural researchers known as extension State Specialists to engage in applied agricultural research. State Specialists are co-funded by the Division of Extension and academic departments at UW–Madison, UW–River Falls or UW–Platteville. State Specialists teach farmers and graduate students who are conducting critical on-farm research that is of direct economic importance to our agricultural economy. This statute requires the UW to track and report the hours that state specialists spend teaching graduate students and teaching Wisconsin farmers. Signed by Governor Evers on March 26, 2021.

- Sales Tax Exemption for Dried Cranberries (ENACTED IN BUDGET BILL – 2021 WI Act 58). The WSCGA worked throughout 2020 to secure an amendment to the 24-state Streamlined Sales and Use Tax Agreement to provide an optional sales tax exemption for sweetened dried fruit (i.e., dried cranberries.) Prior to this amendment, under the Agreement, dried cranberries and other fruits that are sweetened before they are dried, were taxed as "candy." In 2021, we worked with the Administration and the Legislature to adopt this sales tax change into Wisconsin law. Sweetened dried fruit is no longer subject to sales tax in Wisconsin. Signed by Governor Evers as a part of the budget bill on July 8, 2021.

- $2 Million for Positions at UW-Madison Division of Extension (ENACTED IN BUDGET BILL – 2021 WI Act 58). The 2021-23 biennial budget bill included $1,000,000 in additional funding each year of the biennium for state specialists providing extension services at the UW-Madison College of Agricultural and Life Sciences in the field of applied agricultural research. The WSCGA is working with the Division of Extension on identifying and prioritizing these new positions. Signed by Governor Evers as a part of the budget bill on July 8, 2021.

- Expansion of Wisconsin's Agricultural Export Program (ENACTED IN BUDGET BILL – 2021 WI Act 58 and 2021 WI Act 92). The funding for an enhanced agricultural export program was included in the 2021-23 biennial budget bill. Stand-alone legislation was passed after the budget was signed to create the program requiring DATCP to work collaboratively with the Wisconsin Economic Development Corporation to increase agricultural and agribusiness exports over the next five years. Signed by Governor Evers on December 3, 2021.

- NR 151 Amendment to Develop Targeted Performance Standard Nitrates – NOT MOVING FORWARD. In 2019, the DNR commenced the development of an amendment to Wis. Admin. Code. s. NR 151, Wisconsin's nonpoint source pollution standard for agriculture, to promulgate a targeted performance standard to regulate the application of nitrates to agricultural land. The WSCGA and many other commodity groups expressed considerable concerns after the draft rule was released. On November 17, 2021, the Department of Natural Resources sent an email to the members of the NR 151 Technical Advisory Committee informing them that, "The statutory process and associated firm timelines established by the Legislature for rule-making do not allow adequate time for the department to complete this proposed rule." Accordingly, the rulemaking is currently suspended. The DNR would have to put forth a new Scope Statement and initiate a new rulemaking process if they choose to continue to develop this rule.

- Wisconsin Farmers Receive $50 million in ADDITIONAL Pandemic Relief Payments. The WSCGA joined with several other agricultural organizations to secure direct support payments for Wisconsin farmers during 2020. The Evers Administration responded by creating the "Wisconsin Farm Support Program" and distributed $50 million of the federal CARES funding in 2020 AND $50 million in ARPA funding in 2021 – for a total of $100 million in federal funding distributed directly to Wisconsin farmers through this program.

- Rural Well Compensation Grant Program Changes and Producer-Led Watershed Grant Program Changes (2021 AB 728 / SB 678) – PASSED SENATE COMMITTEE. This legislation makes several important programmatic changes to the DNR's well compensation program that are necessary for increased eligibility for well compensation grants to address rural drinking water concerns including nitrate contamination. This program was funded in the 2021 biennial budget bill so that it can be utilized by rural well owners who have elevated contaminant levels in their drinking water wells. The bill also contains several programmatic changes to the producer-led watershed grant program and the county conservation grant program needed to further enhance the utilization of those programs. SB 678 has been recommended for passage unanimously by the State Senate Committee on Agriculture. We look forward to Assembly action in 2022.

- Pilot Program to Address Nitrate Contamination, Funding for Hydrogeologist Position and Cover Crop Insurance Rebates (2021 AB 727 / SB 677) – SENATE COMMITTEE HEARING HELD. This legislation appropriates $1 million in each fiscal year for a commercial nitrogen optimization pilot program requiring DATCP to award grants of up to $50,000 to farmers who implement projects to optimize commercial nitrogen use. The bill also provides funding to create a special three-year project position for one full-time hydrogeologist for the Wisconsin Geological and Natural History Survey focusing on groundwater resource information at the county and local level and also creates a crop insurance premium rebate program where farmers may receive $5 per acre to help offset the costs to plant cover crops. This program is funded at $400,000 per year, beginning in the next fiscal year. SB 677 has had a hearing before the State Senate Committee on Agriculture.

2021 Communications & Marketing Highlights

Like many other organizations, business and WSCGA program areas, 2021 marked a slight return to "normal" for WSCGA's communications program. WSCGA was to move back into some live events and promotions while still maintaining flexibility to accommodate for the world's ongoing reaction to COVID. The flexibility of the PR Committee, WSCGA Board and staff allowed the program to execute quickly and effectively.

Partnerships and Sponsorships
WSCGA continued several partnerships in 2021 and started a few new ones as well.

In late spring, WSCGA partnered with Travel Wisconsin to coordinate Boozy Berries, a virtual cranberry cocktail hour led by one of Milwaukee's best mixologists, Tripper Duval, owner of Lost Whale. The goal of the hour-long event was to bring awareness to Wisconsin as the number one producer of cranberries in the U.S., and celebrate the superfood with a fun, interactive cocktail hour that was educational about the berry as well as the state being a premiere culinary and craft beverage destination. 13 media and influencer attendees who represented a variety of outlets that cover the travel, cocktail and culinary space joined the event, including Food & Wine Magazine, The Washington Times, USA Today, MSN, Forbes, The Kitchn, HuffPost, Fodor's, AFAR, Lonely Planet and Thrillist. In advance of the event, media received a cranberry themed package before virtually arriving at Lost Whale with their cocktail shakers ready. The package included an assortment of cranberry gifts from local Wisconsin purveyors Rooted In Red and RubiReds, as well as all of the ingredients to create the cocktails, including Modest Vodka, produced at a Madison-based distillery, and of course; cranberry juice.

The Wisconsin State Fair was WSCGA's first large, in-person promotional event since the Birkie in February of 2020. The event was successful, despite a lower crowd turnout, unfavorable weather conditions and uncertainty due to COVID. State Fair reported attendance at 840,000 people over the 11 days. This is about 25% lower than years past.

Visitors were able to experience a few new features to our booth, including an update to the WSCGA video that includes several of the video assets produced in the past two years, a very popular photo booth, and a new product, Cranberry Cake Pops from O&H Bakery.

Several growers volunteered their time to go down to Milwaukee and talk to visitors. They were all well received by fairgoers and a huge asset to WSCGA's presence there.

WSCGA partnered with Discover Wisconsin during the summer to create content across their media network. This partnership included an educational video released across multiple platforms, a blog post, a podcast interview, and an email blast to their subscribers. The initial release generated 140k video impressions with many more coming from the supporting content.

WSCGA also participated in two digital partnerships with grocery stores (Hy-Vee and Festival Foods). Both partnerships were digital events focusing on how to include cranberries in meals. The HyVee partnership included an online seminar with a registered dietitian. The Festival partnership included an online cooking class.

WSCGA will also partner with the American Birkenbeiner in February of 2022. This event will mark the return of the in-person Birkie expo. In years past, this expo has been very popular with event attendees. WSCGA staff and grower volunteers operate the sampling booth, distributing juice, SDCs and written material. A new part of this promotion will include the cranberry photobooth on the Saturday following the expo.

Social Media

Social media continued to be a primary way for WSCGA to reach the public during the COVID pandemic. Facebook remained WSCGA's primary platform with a total reach of 545,011 and 31.9k followers. Instagram's reach was 68,417. Additionally, Instagram saw 23% growth in followers.

Influencer Partnerships

Partnering with bloggers and influencers was another priority for WSCGA's communication program. The majority of these partnerships focus on the versatility and/or health benefits of the fruit. Two examples can be found at Blue Bowl Recipes and Joyful Healthy Eats. More partnerships were executed in December and January.

Red Bull Project

In summer, an opportunity to partner with air sports athlete Jeff Provenzano was identified. Jeff is a Red Bull sponsored athlete who performs technical parachute stunts. He approached the industry about creating a cranberry jump video. The project was filmed in late September and released the week of Thanksgiving on multiple platforms. The video was released on WSCGA's social media channels, Jeff's social media channels, Red Bull Adventure and Red Bull Air Force. After one week, the project generated 177k video views and over 5k social media engagements.

Specialty Crop Block Grant

The WSCGA promotions program was awarded a $60k Specialty Crop Block Grant in 2020. This included a "Wisconsin Cranberries'' branded backdrop and juice dispensers to be used at sampling events, a photo booth display that encourages event goers to take photos as if they were in a cranberry marsh and share with on their social media, and customized cranberry packet samples that include information about Wisconsin's cranberry industry.

Additionally, WSCGA produced more engaging video content to be shared on its "Wisconsin Cranberries" social media channels. Cranberries are a unique crop, communicating how growers tend to their crop year-round is an important component of communicating the sustainable nature of the fruit. Last winter, WSCGA used funds from the Specialty Crop Block Grant to fund a sanding video. This video was used at the State Fair display but won't be released online until early 2022.

The final component of the Specialty Crop Block Grant is a public opinion survey to assess the efforts of the Public Communications Program. This survey will be a follow up to the public opinion survey conducted in 2019. The information gained in this survey will help direct the program for the next 3-5 years.

Fall Harvest efforts

Despite challenges presented by the COVID 19 pandemic. WSCGA was still able to safely coordinate media visits to marshes and organize interviews with growers.

WSCGA kicked off its harvest promotions with a sampling event at the Wisconsin Farm Discovery Center in Manitowoc. This two-day event showcased cranberries for museum visitors and generated some media interest in the Milwaukee area.
As in past years, WSCGA provided support to the Warrens, Eagle River and Stone Lake Cranberry Festivals in the form of educational materials, display materials and/or volunteer tour guides. These events are organized and operated by each community with input from growers in each respective area. Each festival has marsh tours available. These are great opportunities for members of the industry to be cranberry ambassadors as members of the public actively seek information about growing cranberries.

A new component of WSCGA's media outreach this year was a media day at the Wisconsin Cranberry Research Station in Millston. This two-day event was successful for a number of reasons. First, it generated a number of positive stories about the industry. Second, it condensed media attention to two days at a controlled location. Third, it showcased the new developments at the Research Station. Growers who participate in media events during harvest are a huge benefit to our industry.
Wisconsin cranberries generated about 500 million impressions across online, print, and broadcast outlets between August and November. The large number of impressions was driven by some very large outlets (USATODAY, Yahoo, New York Times) publishing online stories referencing cranberries. The majority of these stories were positive and educational. Some referenced Thanksgiving inflation and product shortages, but the cranberry industry was able to stay out of most of those stories.

Research Programs

Research Coordination and Administration
Although the WSCGA does not have a direct research program, it does provide administrative services to the Wisconsin Cranberry Board, Inc. Under this agreement, WSCGA provides the staffing services that the WCB needs in order to operate. This allows WCB to maximize its investment in research, education, and promotion programs on behalf of the Wisconsin growers and minimize administration costs.

As part of this service, the WSCGA also works with other cranberry groups to coordinate research activities to avoid duplication and to create synergies and partnerships to maximize the investments by growers.

WSCGA also provides similar services to the WCREF under a contract. Working together, all three organizations developed an industry wide strategic plan in 2018 and began implementation in 2019. Progress has been made to restructure programs, reassign responsibilities, and provide an efficient and coordinated effort on behalf of Wisconsin growers.

2020 saw the completion of Phase I of the renovation of the Cranberry Research Station which included creation of small plots for replicated trials under controlled conditions, a two-acre bed for variety trials and 18 acres of commercial plantings of hybrids from Wisconsin and New Jersey to be evaluated and cropped to generate revenue to support the research station.

The WSCGA also helped coordinate the construction of the new Research and Education Center at the station. The facility includes simple labs, office space, storage, a maintenance area for researchers and a conference room to host education events. The facility opened in early summer of 2021.

Education Program Highlights

Education is a major component of the WSCGA Mission. The Member Education & Communications Manager works with the WSCGA Education Committee to develop and implement high quality and innovative education programs for cranberry growers and members of the public. The Committee coordinates grower education program planning with UW Faculty from CALS and the Division of Extension, with the joint goal of allowing growers to operate their farms in an economically and environmentally sustainable manner.

The Association continued offering virtual events this year, based on the successes seen in 2020. In the first half of the year, programming was offered in a strictly virtual format and as precautions for the COVID-19 pandemic allowed, events transitioned back to an in-person format. Virtual meetings will continue for some events, based on the benefits seen in regards to traveling, scheduling, accessibility, etc. The Association will explore hybrid meeting options going forward.

The partnership with Allison Jonjak, the UW-Madison Division of Extension Cranberry Outreach Specialist, strengthened this year through collaboration on educational topics, events, and outreach. Working with Jonjak, the Education Committee identified topics of interest to the grower member community and delivered programming that focused on information that was both timely and applicable, in formats that were convenient for both farm owners and workers.

Early in the year, the Education Committee created a program plan consisting of monthly events based on quarterly themes. The education program plan was piloted in 2020 and provided a successful framework to offer growers continued learning opportunities throughout the year.

2021 Education Program

Month	Event	Quarterly Theme	Approximate Attendance
January	Virtual Cranberry School	Business Management	200+
February	Business Management Brown Bag		40
March	Farm & Personal Safety Brown Bag		60
April	Virtual Spring Mini-Clinics	Growing Season	113
May	Entomology Brown Bag		80
June	Pests & Nutrients Brown Bag		44
July	Weeds & Soil Moisture Brown Bag Virtual Nutrient Management Training	Pre-harvest/Harvest	38
August	Summer Field Day Mini-Clinics		60
September	Off		
October			
November	Nationwide Research Brown Bag	Research and Out-of-state networking	50
December	Nationwide Research Brown Bag		66

Wisconsin Cranberry School
The 2021 Wisconsin Cranberry School was held virtually on January 27-28, sponsored as a collaborative effort of the Wisconsin Cranberry Research & Education Foundation (WCREF), the WSCGA and the UW-Madison Division of Extension.

The WSCGA Education Committee developed the program and updated the format for a virtual setting. The programming was condensed into three, 2-hour sessions that were spread over the course of the two days. Each session and its presentations were organized to focus on a topic area. Topic areas included Plant Pathology and Weed Management, Entomology, and Physiology and Genetics. Each session contained presentations from the UW cranberry research team, an interactive grower survey and a grower panel, all of which related to the session's topic area.

The virtual school was well-received by the cranberry community, with over 200 people registered. While the Association recognized the need to return to in-person events, when possible, the success of bringing educational opportunities to so many in a virtual format was celebrated.

Virtual Nutrient Management Training
The WSCGA, UW Extension, USDA NRCS and the Wisconsin DATCP held a virtual training session on July 22 for cranberry growers to re-qualify to write nutrient management plans for their farms. The session is part of the ongoing industry effort to assist growers in implementing sustainable management practices and complying with state regulation of nonpoint source pollution.

The workshop was designed to help cranberry farmers write their own nutrient management plans to meet DATCP requirements. Wisconsin DATCP also requires that farmers complete a department-approved training course at least once every four years to maintain their qualification.

Presentations were provided by Mike Stanek, NRCS; Andrea Topper, DATCP and Allison Jonjak, UW-Madison Division of Extension. Since the start of the program, more than 400 growers have participated in the training to become qualified to write a nutrient management plan for their farm.

Virtual Spring Mini-Clinics
The WSCGA and UW-Madison Division of Extension co-sponsored the annual Spring Mini-Clinics on April 13. Allison Jonjak, Cranberry Outreach Specialist, and the WSCGA Education Committee worked to successfully bring the event to a virtual format, with 113 people in attendance for the 2-hour meeting.

The Spring Mini-Clinics is held annually to update growers on new management practices, strategies for the growing season, review of winter impacts, new crop production tools, and informal discussions on the upcoming growing season.

Topics included nutrient application, leafhoppers, and early-season pest scouting, NR151 Performance Standards for Nitrate and Groundwater, spring observations from the field and updates from Research Specialists, Crop Consultants and Field Scientists.

Virtual Brown Bag Seminars
Following the success of the "brown bag" seminars in 2020, the Education Committee worked with Allison Jonjak, Cranberry Outreach Specialist, to continue the Virtual Brown Bag Seminars in 2021. The seminars were held virtually once a month over the lunch hour, providing growers the opportunity to catch up on seasonal updates without having to set aside significant time during the workday. The Education Committee helped to develop topics and plans for the seminars, and Jonjak hosted and facilitated the meetings.

- February: Business Management- SWOT analysis, strategic planning, and business succession and transition planning
- March: Safety Inspections- worker protection safety inspections and review of respirator fit test
- May: Growing Season- Honeybee import requirements, insect control methods and spray timings, crop consultant observations
- June: Growing Season- Fungicides and fruit rot, fertilizing and nutrient uptake, crop consultant observations
- July: Pre-harvest/Harvest- Weeds and pre-harvest intervals, irrigation practices, crop consultant observations
- November: Nationwide Research- pollination deficit, genetics research, fruit color & quality
- December: Nationwide Research- tipworm & Movento, disease research, water quality

Summer Meeting

The 2021 annual Summer Meeting, Field Day, and Trade Show was a very special occasion, marking the Association's return to in-person events and the 150th anniversary of the hosts, Whittlesey Cranberry Company. Over 500 people enjoyed the Field Day on August 11th in Wisconsin Rapids. Participants had the opportunity to tour the marsh, attend mini-clinics, visit the trade show, and socialize with fellow Grower and Associate members.

The day offered a busy program, including tours of the Whittlesey marsh from 9:00am to 1:00pm, the Associate Member trade show from 8:30am to 1:00pm, 4 educational mini-clinics, and an on-site catered lunch.

The marsh tour was developed by Cranberry Outreach Specialist, Allison Jonjak. A handout guided attendees on a 15-minute route around the Whittlesey property. Seven signs marked locations of note and provided information on the marsh.

The trade show consisted of 46 exhibitors who provided inviting displays and shared information on new products and services.

The mini-clinics provided education on a variety of subjects, including:

- Statewide Field Update and a discussion of key 2021 growing season topics
  - *David Jones & Christina Maley, Ocean Spray Cranberries, Inc.*
- Updates on Crancam and Nutrient Management
  - Jyostna Mura, UW-Madison/ USDA-ARS
- Cranberry False Blossom Update and Leaf Spot Diseases
  - Leslie Holland, UW-Madison
- Cranberry Outreach: Talks And Trials, Brown Bags and More!
  - Allison Jonjak, UW-Madison Division of Extension Cranberry Outreach Specialist

Due to severe weather risks, the Field Day ended early for the safety of all attendees, exhibitors, volunteers, staff, and vendors. An abbreviated Summer Meeting was held in the early afternoon. WSCGA President Steven Bartling proudly presented plaques to recognize the event hosts and 2020 marsh anniversaries.

WSCGA NEWS

Each month, members of the WSCGA are provided with up-to-date information on the cranberry industry, news, activities, and anything that would be of interest to the growers of Wisconsin's number one fruit crop. WSCGA coordinates the publication of the newsletter and solicits articles from a cross-section of organizations and individuals. The NEWS is distributed in both print and electronic form with over 600 people on the subscription list.

Weather Forecasting
The Wisconsin Cranberry Board, Inc. has provided funding for weather forecasting services for decades. WSCGA administers the program for the industry. Working with forecasters from Great Lakes Weather Services, daily forecasts are available online and via a toll-free number. The forecasts are specific to cranberry farms and are an important tool for growers as they make decisions about management practices such as frost protection. The forecasts are available April 15 through October 31.

Associate Member Programs

The WSCGA has an active program for the businesses that support the industry in the state. Associate Membership in WSCGA allows these companies to participate in a wide variety of marketing opportunities. The most popular are the Winter and Summer Trade Shows. The Association's advertising program offers opportunities in the WSCGA NEWS as well as the Summer Meeting publications. Associate members are also actively involved in industry events such as the annual Cranberry Open Golf Outing and the Sporting Clays Shoot.

A Committee of the Associate membership works with WSCGA Staff to develop and conduct these programs. Highlights for 2021 include:

Virtual Winter Trade Show Winter Trade Show
The annual Winter Trade Show is held in conjunction with the Wisconsin Cranberry School and the WSCGA Winter Meeting. The 2021 event took place virtually on January 27-28. The new virtual approach allowed the WSCGA to create an online sponsorship program. The online sponsorships provided the opportunity for WSCGA Associate Members to sponsor the entire event, a single day of the event, or a single session of the event, at varying levels of costs. Sponsors were recognized with logo placement on the conference website, a virtual exhibit booth, in-session "commercial" breaks and recognition, moderating sessions, and virtual tote bag items and giveaway prizes.

Virtual exhibit booths were included as part of the 2021 Cranberry School online platform, providing WSCGA Associate Members with the opportunity to have a presence during the event and network with attendees. The virtual exhibitors customized their booth features including logos, photos, links, files, videos, etc. and WSCGA added some fun to the virtual meeting platform. Attendees could chat with Associate Members and explore trivia and games while learning about new products, services, and technology from industry colleagues. The virtual exhibits allowed attendees to network and engage with exhibitors and meeting-goers and included chances to win giveaway prizes provided by the online sponsors.

Summer Trade Show
The annual Summer Trade Show is held in conjunction with the WSCGA Summer Meeting and Field Day. The 2021 event was hosted on August 11th by the Detlefsen family and team at Whittlesey Cranberry in Wisconsin Rapids. Over 500 people attended, taking part in a busy program of marsh tours, educational mini-clinics, the WSCGA Annual Summer Meeting as well as the Summer Trade Show.

The trade show consisted of 46 exhibitors who provided inviting displays and shared information on new products and services. Cranberry growers and their families had the opportunity to experience the host marsh and take part in the above activities, as well as renew connections with the Associate members that made the trade show possible.

WCREF Fundraising Activities

The Wisconsin Cranberry Research and Education Foundation hosts annual fundraising activities including the Cranberry Open Golf Outing and the Sporting Clays Shoot. The Associate Membership of the WSCGA has a strong history of supporting these events through participation and sponsorships, as well as monetary and raffle donations. After canceling these events in 2020 due to the Coronavirus pandemic, both the golf outing and the clays shoot made a strong return in 2021.

Proceeds from past events have been used for scholarship funds at UW-Madison, UW-Stevens Point, UW-La Crosse, UW-River Falls, WWTC Foundation, and provided support for the Wisconsin Cranberry Discovery Center, WCREF and UW Koller Fund for Graduate Studies.

WISCONSIN STATE CRANBERRY GROWERS Association

WSCGA Mission:

The Wisconsin State Cranberry Growers Association enables Wisconsin cranberry growers to prosper by providing growers with information, championing responsible environmental stewardship, advocating for sound governmental policies and leading effective public communications and outreach.