2024 Annual Winter Meeting of the American Cranberry Growers Association

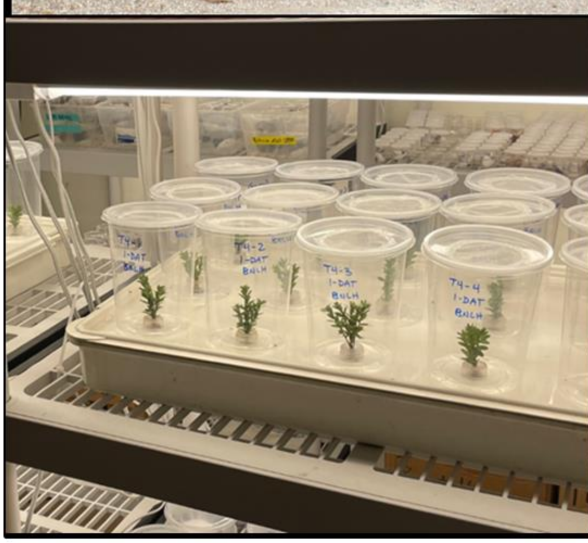
AMERICAN CRANBERRY GROWERS association

Rutgers University EcoComplex

Bordentown, NJ

Thursday
January 18, 2024

RUTGERS
New Jersey Agricultural Experiment Station



Presentation Summaries

ACGA Winter Meeting Program

Thursday, January 18, 2024

Rutgers EcoComplex, Bordentown, NJ

8:00-8:30 Registration and Coffee

8:30-8:50 Welcoming Remarks– ***Shawn Cutts*, President, ACGA**
Treasurer's Report ***– Shawn Cutts***

8:50-9:20 C**ranberry Statistics**
Bruce Eklund, National Agricultural Statistics Service, Trenton, NJ

9:20-9:40 **Tackling the Reemergence of False Blossom Disease**
James Polashock, Research Plant Pathologist, *Joseph Kawash*, and *Lindsay Erndwein*, USDA-ARS, P.E. Marucci Center, Chatsworth, NJ

9:40-10:00 **Update on 2023 Crop Safety and Herbicide Efficacy Evaluations**
Thierry Besancon, Associate Professor & Extension Specialist, Department of Plant Biology, Rutgers University, and *Wesley Bouchelle*, P.E. Marucci Center, Chatsworth, NJ

10:00-10:20 **Management for Stable Fruit Quality in an Environment of Changing Rules and Regulations**
Peter Oudemans, Professor, P.E. Marucci Center for Blueberry & Cranberry Research & Extension, Rutgers University, Chatsworth, NJ

10:20-10:40 **Break**

10:40-11:00 **Pre-breeding for Stability in the Face of Environmental Variation**
Jeffrey Neyhart, Research Geneticist, USDA-ARS, P.E. Marucci Center, Chatsworth, NJ, and *Breanne Kisselstein*, USDA-ARS/ORISE Postdoc

11:00-11:20 **Results from 2023 Insecticide Trials**
Cesar Rodriguez-Saona, Professor, Department of Entomology, Rutgers University, New Brunswick, NJ and *Robert Holdcraft*, P.E. Marucci Center, Chatsworth, NJ

11:20-11:40 **Historical Breeding Efforts Shape Future Trajectory**
Gina Sideli, Assistant Professor, Department of Plant Biology, Rutgers University *Jennifer Johnson-Cicalese,* Research Associate, *Sara Knowles* and *Thomas Spain*, Technicians, P.E. Marucci Center, Chatsworth, NJ

11:40-12:00 **Cranberry Institute – An Update (VIRTUAL)**
Katherine Ghantous and *William Frantz*, Cranberry Institute, Carver, MA

12:00-1:00 **Lunch**

1:00–1:20 **Novel Weed Control Technology: Opportunities and Knowledge Gaps**
Lynn Sosnoskie, Assistant Professor, Weed Ecology and Management for Specialty Crops, Cornell AgriTech, Geneva NY

1:20–1:40 **Tissue Testing for Nutrient Management & Underwater Temperature Evaluation in NJ**
Lindsay Wells-Hansen, Sr. Agricultural Scientist, Ocean Spray Cranberries, Chatsworth, NJ

1:40–2:00 **Motor Vehicle Regulations Impacting Farmers**
Ben Casella, Field Representative, New Jersey Farm Bureau, Trenton, NJ

2:00–2:30 **Pesticide Safety Update: Exposure, Recordkeeping, and Storage**
Kate Brown, Program Associate—Commercial Agriculture, and William Bamka, Rutgers Cooperative Extension of Burlington County

2:30 **Adjournment**- *ACGA Board of Directors Meeting*

New Jersey Agricultural Statistics

Bruce Eklund
State Statistician
NJ Field Office
National Agricultural Statistics Service

503.308.0404

bruce.eklund@nass.usda.gov

The USDA's National Agricultural Statistics will release the 2023 Non-citrus Fruit and Nut Final Summary May 7, 2024, at:

https://www.nass.usda.gov/Publications/Reports_By_Date/index.php

USDA-NASS will publish cranberry acres, yield, production, price, and value of production by state. We want to work with you to get the best data to accurately represent New Jersey cranberries. **Thank you for your help.**

We will release the 2022 Census of Agriculture February 13, 2024. On January 3, 2024 we released fruit and vegetable Final Estimates.

You can get e-mail alerts for New Jersey and Regional customized reports:

https://www.nass.usda.gov/Statistics_by_State/New_Jersey/index.php

Look under 'I want to' on the left.

Update on 2023 Crop Safety and Herbicide Efficacy Evaluations

Thierry E. Besançon
Associate Professor and Extension Weed Science Specialist

Pendimethalin, fluridone and sulfentrazone recently received registration for use in cranberry. Previous research indicated that sulfentrazone applied at 420 g ai ha-1 at the cabbage head stage increased the rate of terminal bud necrosis. In 2017, the use of pendimethalin in highbush blueberry plantations in New Jersey was associated with widespread phytotoxicity. High pendimethalin use rate, crop shallow root system, edaphic conditions, and herbicide applications timed after blueberry went out of dormancy increased the risk of related injury.

Multistate evaluations of pendimethalin on cranberry in 2022 showed that pendimethalin applied at rate > 320 g ha-1 and/or after cranberry buds break dormancy could induce severe stunting and reduce berry yield. Fluridone has not been previously investigated for use on cranberry in New Jersey, warranting an evaluation of crop tolerance and weed control efficacy of these herbicides when applied before cranberry breaks dormancy. Treatments were boom-applied at 280 L ha-1 at the tight bud stage (April 24) on a 1-yr old nonproductive "Haines" bed in Southampton, NJ, and a 20-yr old productive "Ben Lear" bed in Chatsworth, NJ. Herbicide treatments included pendimethalin at 0.8 or 1.6 kg ha-1, fluridone at 0.22 or 0.45 kg ha-1, and sulfentrazone at 0.28 or 0.42 kg ha-1. For comparison purpose a nontreated control as well as a standard application of napropamide at 6.7 kg ha-1 were also included.

In the Southampton nonproductive bed, fluridone provided ≥ 97% large crabgrass [*Digitaria sanguinalis* (L.) Scop.] control throughout the season at both rates while control with sulfentrazone decreased to < 50%. By the end of the season (150 DAT), only fluridone at 0.22 or 0.45 kg ha-1, and pendimethalin at 1.6 kg ha-1 provided greater control than the napropamide standard. Stunting of new cranberry shoots exceeding 13% was noted 28 and 60 DAT with pendimethalin at 1.6 kg ha-1 whereas fluridone or sulfentrazone did not cause significantly greater stunting than the non-treated control or the napropamide standard at both dates.

In the Chatsworth productive bed, fluridone application was associated with transient chlorosis (up to 6%) of new cranberry shoots that completely recovered by 60 DAT. As for the other location, pendimethalin application at 0.8 or 4.6 kg ha-1 was associated with severe stunting of new growth that culminated 42 DAT with 22% and 36%, respectively, compared to ≤ 7% for other herbicides. With the exception of napropamide that provided 56% control 60 DAT, none of the other herbicides controlled Carolina redroot [*Lachnanthes caroliana* (Lam.) Dandy], a perennial troublesome of new Jersey cranberry beds. Berry yield was not affected by preemergence herbicides and ranged from 1.6 to 2.4 kg m-2.

Overall, fluridone provided better weed control and similar crop tolerance than the napropamide standard.

Management for Stable Fruit Quality in an Environment of Changing Rules and Regulations

Peter Oudemans
P.E. Marucci Center, Rutgers University, Chatsworth, NJ

The challenges of cranberry farming are increasing, including not just the biological, climatic and physical parameters but also the complexity of regulatory controls. In my research program the primary objectives are to develop and implement effective and appropriate tools for managing cranberry fruit rot. Fungicides, such as chlorothalonil and mancozeb, have provided effective broad-spectrum control of cranberry fruit rot since 1935. Newer classes of fungicides have been implemented with good success. Specifically, azoxystrobin (2003), fenbuconazole (2005) and other related fungicides are now critical components of an effective fruit rot management program. These newer fungicides are vulnerable to fungicide resistance and proper use patterns will govern the rate of resistance development. The most common use pattern used in New Jersey ensures minimal selection pressure on the fungal populations.

Overheating is second major factor affecting fruit quality. Fruit affected by overheating exhibit symptoms similar to fruit rot and these can easily be confused. The interaction of fruit rot and overheating is important because overheating can promote the onset of fruit rot. In other words, nonsymptomatic fruit that are infected by fruit rot fungi begin exhibiting symptoms after being overheated. See the accompanying figure outlining the hypothesis for this interaction.

Diagram illustrating the interaction of fungal infection and overheating on the risk for impacting fruit quality. Quadrant 1 shows the risk where the greatest proportion of fruit develop "rot" symptoms. As risk factors are removed (quadrants 2-4) the risk declines. The graph shows gradients since the effects are quantitative.

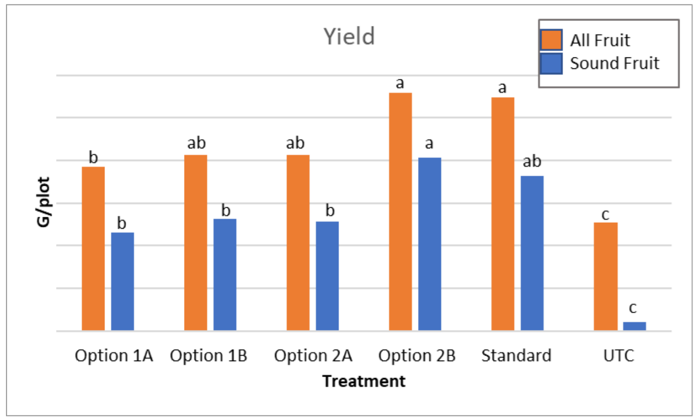
Research focused on management for fruit quality is evolving and new recommendations are being developed. Currently, fungicide application and timing, short irrigation applications during heat prone times are the most effective strategies. For the remainder of the presentation, I will discuss the research areas for improved management.

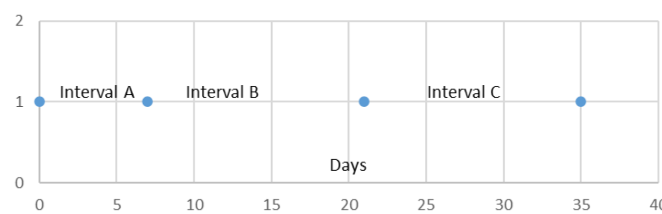
The fungal fruit rot population: Over the past four years we have investigated the population structure of the cranberry fruit rot fungi. Two species, *Coleophoma cylindrospora* and *Colletotrichum fructivorum* are the most common ones found. Other species such as *Phomopsis vaccinii, Physalospora vaccinii* and *Phyllosticta vaccinii* are also important players. It is critical to understand the life history of each species to ensure that appropriate controls are used for each one.

Fungicide alternatives: Fungicides are grouped according to the mode of action and different modes of action are implemented in particular ways. For example, spore germination inhibitors are used preventatively while growth inhibitors can be used both preventatively and curative. To speed up screening, a novel lab-based bioassay using flower extracts (FLEX Bioassay) was developed. Using this method, two new fungicides were identified, and these were tested in field trials for activity and in 2023 in use pattern trials. Both are performing very well and show excellent potential for chlorothalonil replacement.

Use Pattern Trial Results 2023

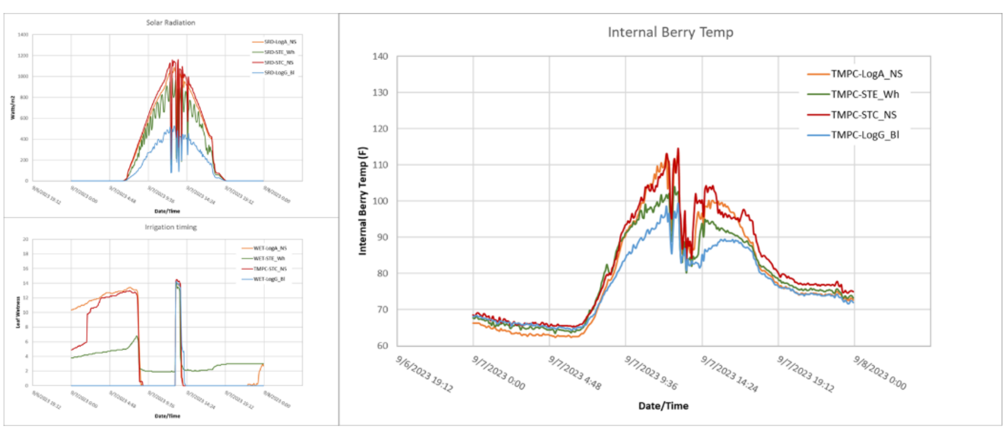
Treatment	Bloom 1	Bloom 2	Post-bloom 1	Post-bloom 2
Option 1A	Fung 1	Fung 1	QuadrisTop	QuadrisTop
Option 1B	QuadrisTop	Fung 1	QuadrisTop	Fung 1
Option 2A	Fung 1	Fung 1	Fung 2 (mix)	Fung 2 (mix)
Option 2B	Fung 1	Fung 2 (mix)	Fung 1	Fung 2 (mix)
Standard	QuadrisTop	QuadrisTop	Bravo	Bravo
UTC	No Fungicide	No Fungicide	No Fungicide	No Fungicide





Both new fungicides under investigation are not yet labelled. In Option 1 the Fung 1 is being tested in a program with QuadrisTop while in Option 2 Fung 1 and Fung 2 mix are being tested using different rotational patterns. The standard use pattern includes QuadrisTop and Bravo and these are all compared with a no fungicide check. The trial was conducted using the cultivar Haines. All of the treatments performed better that no fungicide. Option 2B was the only one tested that was equivalent to the standard use pattern. Fung1 is reported to have a relatively short residual period and it is likely that Option 2B maximized the efficacy during critical periods for control. Based on these results it is likely that Option 2B is indicative of future programs. It is important to note that under this option no FRAC Group 3 fungicides were included. Thus, additional flexibility for testing and development will be conducted in 2024. With the potential availability of four FRAC Groups with activity against fruit rot, the prospect of maintaining good fruit quality in a changing regulatory landscape remains very good.

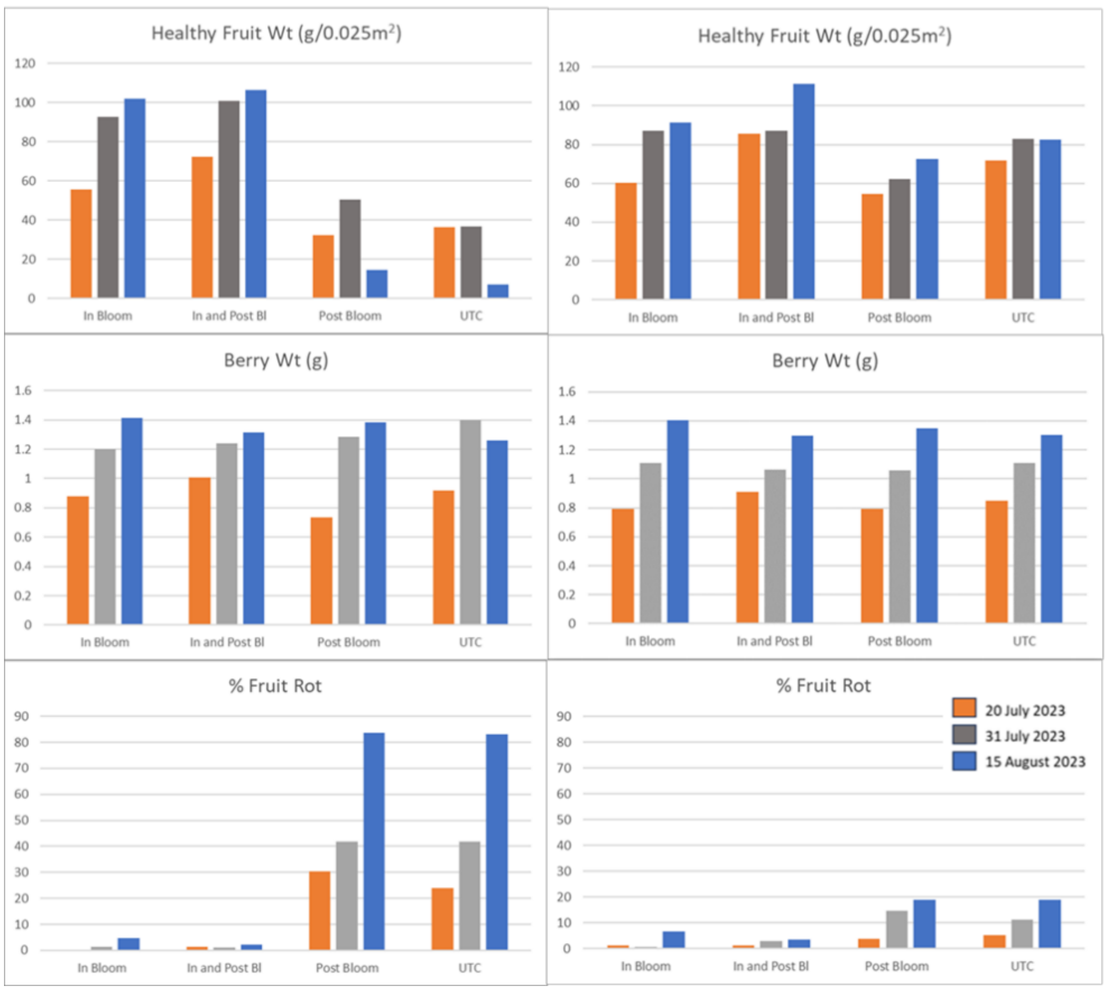
Overheating: Irrigation for evaporative cooling remains the most effective method for maintaining fruit quality during the late summer and early fall when conditions can lead to softened, rotted and unusable fruit. In this figure from September 7 2023, solar radiation was causing fruit temperatures to rise above the 108F threshold. A brief 30-min irrigation was sufficient to cool the fruit for the remainder of the day. In this trial shaded and unshaded fruit exhibited identical fruit quality because irrigation was sufficient to protect from overheating.



Cranberry Fruit Rot Resistant Genotypes: Seven novel genotypes are being tested against a fruit rot susceptible cultivar Haines. These genotypes are considered elite selections developed by the

Rutgers Breeding Program with enhanced resistance to cranberry fruit rot while maintaining other horticulturally desirable traits such as yield, shape, berry size etc. The results of this breeding effort are being investigated under different fungicide use patterns to determine how new varieties will perform and how adaptable they are to changing regulatory conditions. For this project, three use patterns are tested against an untreated control. In-bloom, out-of-bloom treatments are compared with a four-fungicide treatment typical of the most common commercial use pattern.

Haines (CQ x 35) CNJ12-30-24 (MQ x CNJ06-22-10)



In the example above three evaluation periods are presented. In-bloom and in- plus post-bloom are most effective in reducing fruit rot. With the susceptible Haines variety fruit rot increased over time to >80% in the post-bloom and untreated control. With the more resistant CNJ12-30-24 fruit rot levels did not exceed 20%. Data collected at harvest shows that fruit rot levels increase for all but the 4-spray use pattern in the cultivar Haines whereas in some of the fruit rot resistant varieties the in-bloom sprays maintain equivalent control to the 4-spray use patterns. These data and this trial show that use of resistant cultivars will provide added resilience to the cranberry fruit rot management program and allow greater flexibility in fungicide choices.

Summary: The use of tools for producing high quality cranberry fruit is highlighted here. Older fungicides such as chlorothalonil have long residual times and provide long term control during the growing season. The broad spectrum of action and superior protection by these fungicides has provided the backbone of the cranberry fruit rot management program. Also, from a fungicide resistance management standpoint chlorothalonil is very effective. Implementation of newer fungicides requires knowledge of persistence, as well as spectrum of action and mode of action. These fungicides should provide excellent efficacy when used properly. Unfortunately, the use patterns being tested are vulnerable to climatic variability (especially rainfall). Managing overheating will provide a second significant method for maintaining high quality cranberry fruit. Integrating cranberry fruit rot resistant varieties will further bolster resilience to changes in climate and regulations.

Pre-Breeding for Stability in the Face of Environmental Variation

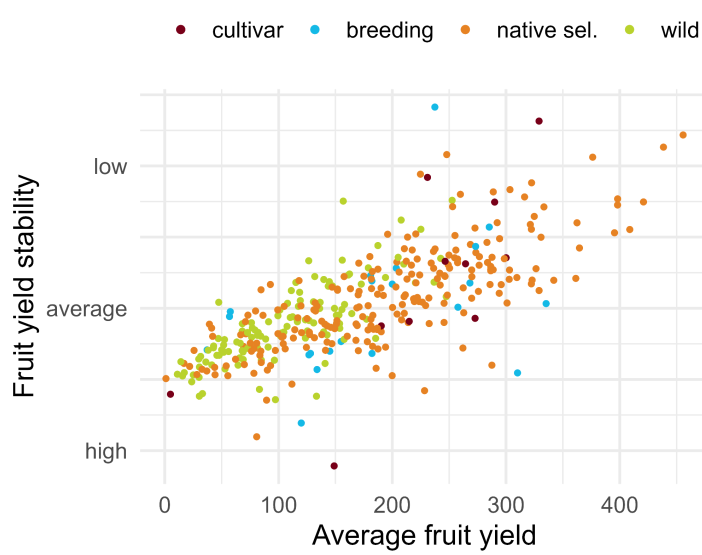
Jeffrey Neyhart, jeffrey.neyhart@usda.gov
Research Geneticist, USDA-ARS
Breanne Kisselstein, Postdoctoral Research Associate, ORISE / USDA-ARS

Pre-breeding goal: The goal of the USDA-ARS cranberry pre-breeding program is to breed germplasm with improved disease resistance and environmental stress tolerance while preserving high fruit yield and quality. Wild or unimproved cranberry germplasm may contain favorable traits for breeding, including stress tolerance traits, and we are conducting experiments to understand the genetic variation for these traits in diverse germplasm and how we can make selections in the pre-breeding program.

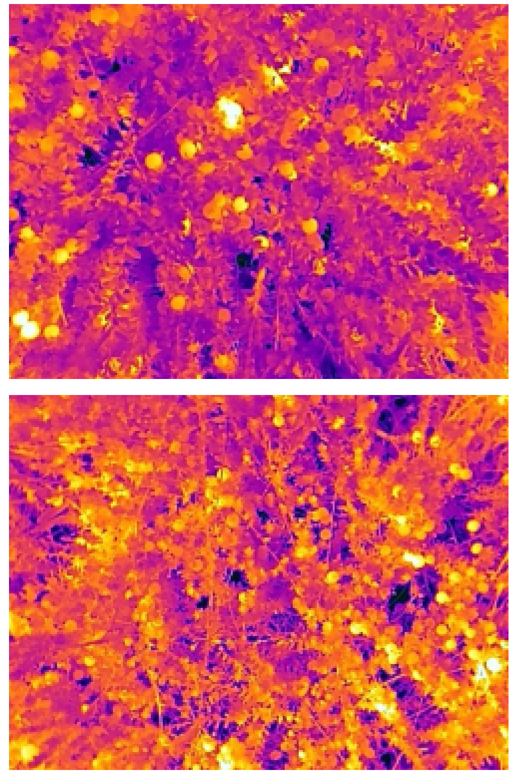
Identifying environmentally stable lines from diverse germplasm

The phenotype (or observed traits) of a genotype or variety is determined by both genetic factors and environmental factors. These often interact, leading to different responses of genotypes to different environmental conditions, a pattern known as **genotype-environment interaction**. For example, if one genotype yields well under drought conditions, but another yields well under wet conditions, this would be a genotype-environment interaction.

The response of a genotype to the environment can be characterized as **stable** or **unstable**. A stable genotype will yield consistently under a range of environmental conditions or stresses, while an unstable genotype will not. The ideal genotype is one that is high-yielding *and* stable. Wild germplasm or native selections may be more stable, since natural selection acted to increase their adaptation to stressful environments. We analyzed historical fruit yield data from the Rutgers germplasm collection (figure at right), which showed that wild and native genotypes are more stable than breeding lines or cultivars, which are more high-yielding. By selecting stable, wild genotypes and crossing them with high-yielding, elite genotypes, we may produce the ideal combination of both.



We are also investigating diverse germplasm for stability to specific environmental stresses such as heat. In 2023, we used our thermal camera system to capture thermal in-field images of all 312 genotypes in the Rutgers germplasm collection (examples at right). These thermal images enable us to measure the temperature of the canopy of each plot during a heat stress event, and we can use this information to determine which genotypes are able to maintain cooler temperatures. We will analyze this data along with end-of-season fruit yield and fruit rot data to determine the available genetic variation for heat stress response and the impact of that response on yield and quality.



Genotypes displaying a cooler canopy (top) and hotter canopy (bottom)

Understanding genotype-environment response across growing regions

We are also interested in understanding how genotypes respond to environmental conditions across larger spatial scales. As part of a funded collaborative USDA-SCRI grant to understand cranberry fruit rot, our new postdoc, **Breanne Kisselstein**, is analyzing many years of fruit yield, rot, and quality data from variety trials in New Jersey, Wisconsin, Oregon, and British Columbia. Her research will help us understand how genotypes respond to a wide variety of environmental conditions and whether stable genotypes or varieties are more resistant to fruit rot.

Results from 2023 Insecticide Trials

Cesar Rodriguez-Saona and Robert Holdcraft
P.E. Marucci Center, Rutgers University

In 2023, research was conducted at a commercial cranberry farm and at the Rutgers P.E. Marucci Center to: a) study the seasonal phenology of blunt-nosed leafhoppers; b) evaluate new insecticides against blunt-nosed leafhoppers and Sparganothis fruitworm.

Seasonal phenology of blunt-nosed leafhoppers

In 2022-2023, we conducted studies to determine the seasonal phenology of blunt-nosed leafhoppers (BNLH) in cranberries and develop degree-day models. For this, sweep net sampling was conducted from May until August in 4 beds at a commercial cranberry farm. The number and development stage of BNLH leafhoppers was recorded. These studies show that BNLH nymphs peak around mid-June, while adults peak by mid-July (Fig. 1). The study will continue in 2024.

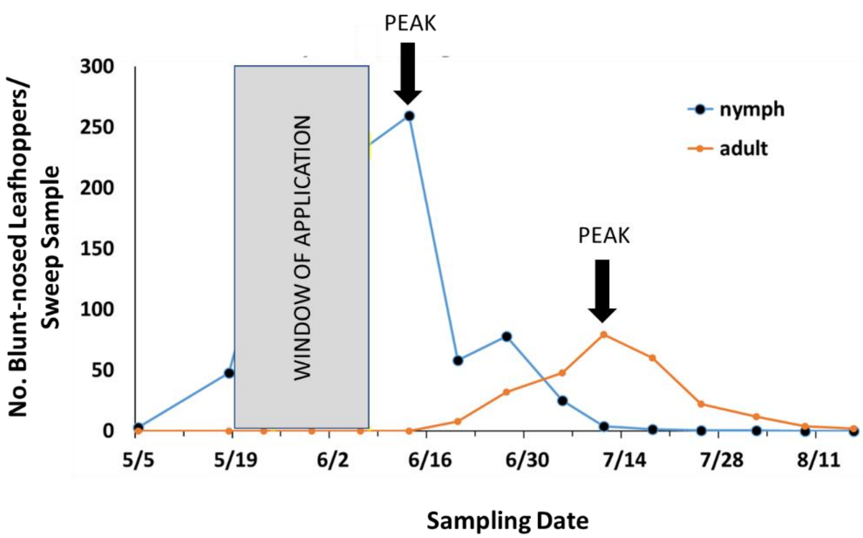


Fig. 1. Phenology of BNLH nymphs and adults in cranberry beds in NJ.

Toxicity of new insecticides against blunt-nosed leafhoppers and Sparganothis fruitworm

a) Blunt-nosed leafoppers

In 2023, we conducted an experiment to test the efficacy of a new insecticide versus Danitol 2.4EC (fenpropathrin) (grower standard) for controlling BNLH nymphs and adults in cranberries. The experiment was conducted in a cranberry bed ('Haines' variety) located at the Rutgers P.E. Marucci Center in Chatsworth, New Jersey.

Treatments for nymphs and adults were applied on 9 June and 17 July 2023, respectively. Treated cranberry uprights were clipped and inserted together in florist's water picks with an opened bottom. The tops of uprights with leaves were enclosed in assay containers consisting of a ventilated 32-oz plastic deli cup with a hole cut in the bottom; the florist's water pick was fit tightly through the hole (Fig. 2). The cut ends of uprights were stripped of leaves before insertion into the water picks and were then placed in water-filled trays. For nymphs, foliage was collected at 0, 3, and 6 days after treatment (DAT). For adults, foliage was collected at 0 DAT. Five field-collected nymphs or adults were placed inside each container (N = 8 containers for nymphs and 5 for adults). The number BNLH alive, moribund, or dead was recorded 24 h, 72 h, and 1 week after setup.

For nymphs, the new insecticide resulted in low (<10%) mortality 24 h after exposure at 0, 3, and 6 DAT. However, it caused high (>80%) nymphal mortality 7 days after exposure at 0, 3, and 6 DAT. This indicates that the lethality of the new insecticide on BNLH nymphs increased with the time of exposure. In contrast, Danitol caused high nymphal mortality after shorter times of exposure. Similar to nymphs, the new insecticide caused low BNLH adult mortality after 24 h of exposure that increased at day 7, whereas Danitol caused 100% adult mortality after 24 h of exposure.

Fig. 2. Assay used to test efficacy of insecticides against insect pests.

b) Sparganothis fruitworm

This experiment tested the efficacy of a new insecticide versus the insect growth regulator Intrepid 2F (methoxyfenozide) (grower standard) for controlling both first and third instar larvae of Sparganothis fruitworm on cranberries. The experiment was conducted in a cranberry bed ('Haines' variety) located at the Rutgers P.E. Marucci Center in Chatsworth, New Jersey.

Treatments were applied on 17 July 2023. Treated cranberry uprights were clipped and inserted together in a florist's water pick, as described above. The tops of uprights with leaves were then enclosed in assay containers consisting of a ventilated 32-oz plastic deli cup with a hole cut in the bottom; the florist's water pick was fit tightly through the hole (Fig. 2). Foliage was collected at 0 DAT, 3 DAT, and 7 DAT. Six containers were set up for each treatment and instar. Three 1st instar or two 3rd instar larvae were placed in each assay container. The number of larvae alive, dead, or missing was recorded after 7 days.

The new insecticide provided high (>75%) mortality against 1st instars that was comparable to Intrepid 2F. This high mortality on 1st instars lasted for at least 7 days. Similarly, the new insecticide provided high (>80%) mortality against 3rd instars that was comparable to Intrepid 2F and that lasted for at least 7 days.

Historical Breeding Efforts Shape Future Trajectory

Gina Sideli, gina.sideli@rutgers.edu
Assistant Professor, Department of Plant Biology, Rutgers University
Jennifer Johnson-Cicalese, Research Associate, Sara Knowles and Thomas Spain, Technicians,
P.E. Marucci Center, Chatsworth, NJ

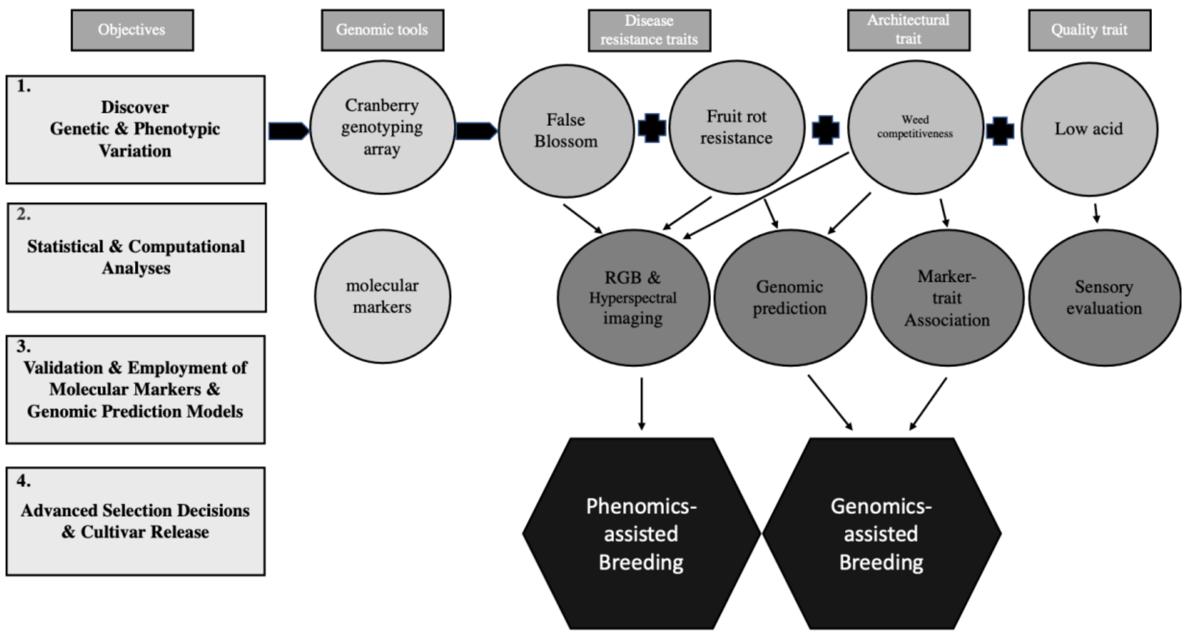


Figure 1. Schematic representation of the steps involved in both *Phenomics* and *Genomics-assisted breeding*, the cornerstones of modern breeding.

Future plans for the Rutgers cranberry breeding include objectives 1–4. Projects will begin this year for disease resistance traits, an architectural trait, and a quality trait. Obj 1. Genotypic variation will be evaluated by genotyping germplasm with a cranberry genotyping array. Obj 1. Phenotypic variation will be measured by utilizing various machines for objective, and precise data acquisition. This encompasses the term *Phenomics-assisted breeding* by using drones and ground robots in the field and computer vision systems in lab or greenhouse all equipped with RGB and/or hyperspectral sensors for large-scale or high-throughput phenotyping. Obj 2. Statistical and computational analysis consists of a reconstruction of the breeding program pedigree (for confirming or reassigning parentage), marker-trait associations (linking a genotype to a phenotype), genomic prediction (predicting a phenotype, or trait, of a group of individuals by using phenotype data of highly related individuals) all using the newly generated genotyping data. Obj 3. An outcome of the above analyses is the creation of either molecular markers (to use for screening populations for a specific allelic combination) or genomic prediction models (for complex traits that involve many genes and the ability to ascertain a phenotype without actually phenotyping). Obj 4. The final and end result will be to make advanced selection decisions (for future parent crosses) from the processes explained above and to RELEASE A NEW, IMPROVED CULTIVAR.

Novel Weed Control Technology: Opportunities and Knowledge Gaps

Lynn Sosnoskie
Assistant Professor, Weed Ecology and Management for Specialty Crops
Cornell AgriTech, Geneva NY

Fruit and nut crops are important contributors to local and regional economies. According to the 2017 USDA census of agriculture, perennial crops are grown on 6 million acres across 110,000 farms; recent statistics place the total value of the industry at $29 billion. This includes berries and cranberries which are grown nationally (with main production centers occurring in the US's Western, Southern, Great Lakes, and Atlantic Coast regions). Weeds are a significant threat to perennial crops. Competitive interactions, particularly during the establishment phase, can negatively impact stand development and delay fruit production. Additionally, weeds can provide cover for vertebrate pests, serve as alternative hosts for deleterious insects or pathogens, physically interfere with other crop management practices, hinder harvest operations, and increase labor costs.

To preserve yields, many perennial crop growers rely heavily on herbicides for weed control. However, their use is not always desirable. In addition to the evolution of resistance across weed species (e.g., 112 cases reported across blueberries, grapes, and orchard crops), the potential for crop injury and worker safety concerns are also deterrents. Non-harmonized pesticide residue limits between the US and key export markets may serve as a trade barrier and alter grower decision-making with respect to weed control programs. Potential regulatory hurdles associated with the EPA's workplan to meet statutory obligations under the Endangered Species Act could affect the registration/reregistration of pesticides, which are already limited. Hand-weeding is threatened by rising wages, an aging and shrinking workforce, and uncertain immigration policies. Research has shown the growing importance, and simultaneous dearth, of migrant labor for managing pests.

Given the constraints associated with current weed management practices in perennial crops, many growers and industry personnel are looking for alternative tools to suppress unwanted vegetation. This includes precision vision-guided sprayers, electrical weeders, and autonomous robotic units. Some companies are actively working in commercial systems while others are finding their footing. Many are concentrating their efforts in Western US production systems, which are markedly different from Eastern farms. Based on presentations at the meeting and conversations with attendees, the industry will need to address some barriers before most technologies can be widely and successfully deployed across the US.

Some barriers include:

1. COST

Of the weeding units themselves, which range in price from tens of thousands of dollars to over $1 million, but also parts and services, particularly if companies do not have local bases of operation. Would the adoption of novel technology require significant changes to production parameters, necessitating the acquisition of additional equipment.

2. ADAPTABILITY AND VERSATILITY

Western and Eastern US farms can differ greatly with respect to soils and terrain, weather patterns, field sizes and shapes, available capital, etc. Have these technologies been thoroughly and successfully evaluated under local conditions? If not, how much work needs to be done to assure Eastern growers that the tools can be successfully integrated into current crop management programs?

3. INFRASTRUCTURE AND LABOR

Are cellular and internet services sufficient to support the needs of current and future novel technology? GPS with RTK correction availability? Do farms have personnel with mechanical, electronic, and programming skills to operate and service new technology?

Many companies are actively reaching out to growers. So, what should you do if you're approached by a company advertising novel technology?

1. Engage, repeatedly, with companies before committing; ask for demonstrations across production conditions and environments. Collect your own data about performance and crop safety. Compute ROI for yourself and do not accept numbers blindly. Discuss the possibility of buy back programs to protect against obsolescence.

2.Understand that reducing costs may not be truly feasible; controlling costs may be a more realistic goal.

3. Acknowledge that technology companies, despite their engagement with the agricultural industry, may not fully understand specialty crop problems. As the target audience for novel technology, growers should work with industry partners to develop and refine tools, but don't do a company's R&D for them. Partnerships can be rewarding, but don't become over extended.

4. Many companies can provide growers with data derived from in-field operations; but data is not the same as information. Learn how accessible your field records will be and how best you can integrate them into your weed management plans.

5. Risk will be part of the process but don't get over extended. Consider if you are a candidate for direct sales vs service contracts. If you want to own, have a team in place that is comfortable using and servicing the technology. This will likely require familiarity with mechanics, electronics, computer programming, and data analysis.

6. Don't forget that companies are balancing the needs of their customers with the needs of their investors, which can lead to tension.

Tissue Testing for Nutrient Management and Underwater Temperature Evaluation in NJ

Lindsay Wells-Hansen
Ocean Spray Cranberries, Chatsworth, NJ

Tissue Testing for Nutrient Management: Which Lab is Best?

Tissue testing is an essential decision-making tool for nutrient management, especially in a perennial crop like cranberry. Research conducted years ago demonstrated that the best time to collect tissue samples is between August 15th and September 15th. This period is when the nutrients remain the most stable within the plants, and as such, the recommended 'normal' nutrient ranges are based on nutrient levels at this time of year.

Tissue test results are only useful if they're reliable. Recently, results have been inconsistent, within and across years, especially for micronutrients like copper, calcium, and boron. To investigate this, we submitted triplicate tissue samples from 43 NJ beds to three separate labs in 2023 and compared the results. The three labs to which samples were submitted were AgroLab (Harrington, DE), AgSource (Bonduel, WI) and SoilTest (Moses Lake, WA). Not surprisingly, slight variability among labs existed for all samples and nutrients. Nitrogen, phosphorus, and potassium values were similar across labs for all samples. However, substantial differences among labs for several micronutrients, particularly copper and boron, were concerning. For example, copper values were below the normal range in more samples at AgroLab (33=77%) and SoilTest (30=69%) compared to AgSource (9=21%). Unfortunately, there was no clear 'winner' among the labs evaluated. All three were comparable in N, P, and K values reported, but further work is needed to determine why substantial differences in micronutrient analysis exist within and among labs, and whether these differences are meaningful in our nutrient management programs.

As warmer winters prevail, do we need winter floods for cold protection?

NJ cranberry growers have utilized a winter flood to successfully protect cranberry vines from winter temperatures for decades. With warmer winter temperatures becoming increasingly commonplace in NJ, the question of whether we need this winter flood to protect the vines is top of mind. We monitored vine-level underwater temperatures in bogs on three properties in the 2022-2023 winter to glean a better understanding of what temperatures the plants are experiencing from January through April. Although we did have short stints of very cold temperatures (as low as 7°F) during the 2022-2023 winter, average ambient temperatures hovered around 42°F, 40°F, 43°F, and 56°F for January, February, March, and April, respectively. Underwater temperatures remained stable (average ~43°F) in bogs that were able to remain fully flooded for the duration of the winter. In April, as ambient temperatures rose, with daily highs reaching 89 °F on a few days, flooded vines remained nestled around 60°F.

Experience from other growing regions suggests that vines and buds would likely survive the limited colder temperature durations in NJ without a winter flood, but maintaining vines at a constant temperature during days with substantial ambient temperature fluctuations is advantageous for keeping vines dormant until the threat of constant frost/freezes has passed (saving you water, money, and sleep!) and for synchronizing growth within and across bogs and cultivars. Underwater and ambient temperature monitoring will continue through the 2023-2024 winter season, with the addition of dissolved oxygen and spring vine growth monitoring to better understand how flood water temperature affects vine growth, especially for the modern hybrid varieties in the spring months.