2017 Annual Summer Meeting of the American Cranberry Growers Association

AMERICAN CRANBERRY GROWERS association

Rutgers University
P.E.Marucci Center
Chatsworth, NJ

Thursday
August 17, 2017

RUTGERS
New Jersey Agricultural Experiment Station

Presentation Summaries

American Cranberry Growers Association
2017 Summer Field Day
Thursday August 17, 2017
Rutgers University

P.E. Marucci Center for Blueberry & Cranberry Research & Extension,
Chatsworth, NJ

Parking will be available at the Center's shop (across cranberry bogs).
Transportation for tours will be provided at the Center.
Restrooms located at the Center, adjacent to Conference Room.

CRANBERRY BOGS:

8:30–8:45 **Opening Remarks**
Shawn Cutts, President, American Cranberry Growers Association

8:45-9:05 **Screening of POST Herbicides for Controlling Carolina Redroot (*Lachnanthes caroliana*) in New Jersey Cranberry Beds (Bog 6)**
Thierry Besancon and *Baylee L. Carr*, P.E. Marucci Center for Blueberry & Cranberry Research & Extension, Rutgers University, Chatsworth, NJ

9:05–9:25 **Breeding for Fruit Rot Resistance: Evaluation of the Next Cycle of Crosses (Bog 8)**
Jennifer Johnson-Cicalese, Nicholi Vorsa, Karen DeStefano and Susan Vancho, P.E. Marucci Center for Blueberry & Cranberry Research & Extension, Rutgers University, Chatsworth, NJ

9:25–9:45 **Performance of Welker and Haines and other Advanced Selections (Bog 10)**
Nicholi Vorsa, Jennifer Johnson-Cicalese, Karen DeStefano and Susan Vancho, P.E. Marucci Center for Blueberry & Cranberry Research & Extension, Rutgers University, Chatsworth, NJ

9:45-10:10 **Research on Diseases of Cranberries (Bog 15)**
Peter Oudemans, Department of Plant Biology and Pathology, Rutgers University

10:10-10:30 **Is Mycorrhizal Inoculation Efficacious? (Bog 18)**
James Polashock, Research Plant Pathologist, USDA-ARS

10:30–10:50 **On-going Research on Sucking Insect Pests (Bog 19)**
Cesar Rodriguez-Saona, Department of Entomology, Rutgers University; *Vera Kyryczenko-Roth,* P.E. Marucci Center; and *Robert Holdcraft,* P.E. Marucci Center, Chatsworth, NJ

10:50–11:10 **Show and Tell**
Cranberry growers

CONFERENCE ROOM:

11:20–11:30 **Cranberry Statistics**
Bruce A Eklund, State Statistician, U.S. Department of Agriculture | National Agricultural Statistics Service

11:30–12:00 **Root Growth in Cranberries**
Amaya Atucha, Assistant Professor, and *Beth Workmaster*, Department of Horticulture, University of Wisconsin-Madison

12:00–1:00 **LUNCH** (Pole Barn)

1:00–1:30 **Farm Safety**
Ray Samulis, Cooperative Extension Agent, Burlington County Extension, Rutgers University

Screening of POST herbicides for controlling Carolina redroot (*Lachnanthes caroliana*) in New Jersey cranberry beds

Thierry E. Besancon,

P.E. Marucci Center for Blueberry & Cranberry Research & Extension, Rutgers University, Chatsworth, NJ

New Jersey produced 27 million kg of cranberries in 2015 at a farm value of $22 million (USDA 2017). Cranberry beds in New Jersey are concentrated in the Pine Barrens coastal plain where soil conditions (sandy texture, pH 4.0 to 5.0, good drainage) are optimal for cranberry production. The perennial nature of cranberry production predisposes the crop to a diversity of weed species ranging from herbaceous weeds to woody perennial species. Among perennial weed species, Carolina redroot has been an increasing source of concern for New Jersey cranberry growers regarding the lack of sufficient control from their current management strategies. Carolina redroot is a perennial herbaceous monocotyledonous species member of the *Haemodoraceae* family whose common name is derived from the orange to red coloration of its roots and rhizome. Information regarding herbicidal control of Carolina redroot is extremely limited and mostly restricted to blueberry production (Myers et al. 2013). In order to address the issues of successfully managing Carolina redroot under extremely specific environmental and cropping conditions, a study was initiated in 2017 for evaluating the efficiency of ten postemergence herbicides to control Carolina redroot. Diquat at 560 g ai ha^{-1} provided over 90% control up to 21 days after treatment (DAT) but declined after 42 DAT with the emergence of new shoots. Control with mesotrione at 280 or 560 g ai ha^{-1} increased from less than 15% 14 DAT to 97% 63 DAT. Control increased from 14 to 63 DAT with flumioxazin at 210 g ai ha^{-1} (73%) and 2,4-D at 1,280 g ae ha^{-1} (60 %) whereas glyphosate at 1,260 g ae ha^{-1} did not achieve more than 48% control 63 DAT. Other herbicides tested (pronamide at 2,240 g ai ha^{-1}, clopyralid at 70 or 140 g ai ha^{-1}, quinclorac at 1,280 g ae ha^{-1}, carfentrazone at 35 g ai ha^{-1}, and fomesafen at 420 g ai ha^{-1}) provided less than 30% control from 21 DAT onwards. Control of Carolina redroot rhizomes/roots was greatest in plants treated with mesotrione (> 95%), glyphosate (90%), diquat (89%), 2,4-D (84%), and flumioxazin (78%). Non treated Carolina redroot shoot and root/rhizome fresh weight were 5.8 and 7.7 g, respectively. Greatest shoot and root/rhizome biomass reductions were noted with diquat, mesotrione at 280 or 560 g ai ha^{-1}, glyphosate, 2,4-D, and flumioxazin (0.7 and 0.7 g, 0.4 and 1.8 g, 0.3 and 1.2 g, 0.8 and 1.1 g, 1.1 and 1.3 g, 1.5 and 1.5 g, respectively). Clopyralid at 70 or 140 g ai ha^{-1} and fomesafen also reduced root/rhizome fresh weight (4.8, 5.7, and 3.1 g, respectively) but did not decrease shoot biomass. No secondary shoots growing from the rhizome were noted for plants treated with glyphosate, mesotrione, 2,4-D and flumioxazin.

Control of Carolina redroot (*Lachnanthes caroliana*) in cranberry with pre-emergence herbicides

Thierry E. Besancon,

P.E. Marucci Center for Blueberry & Cranberry Research & Extension, Rutgers University, Chatsworth, NJ

New Jersey produced 27 million kg of cranberries in 2015 at a farm value of $22 million (USDA 2017). Cranberry beds in New Jersey are concentrated in the Pine Barrens coastal plain where soil conditions (sandy texture, pH 4.0 to 5.0, good drainage) are optimal for cranberry production. The perennial nature of cranberry production predisposes the crop to a diversity of weed species ranging from herbaceous weeds to woody perennial species. Among perennial weed species, Carolina redroot has been an increasing source of concern for New Jersey cranberry growers regarding the lack of sufficient control from their current management strategies. Carolina redroot is a perennial herbaceous monocotyledonous species member of the *Haemodoraceae* family whose common name is derived from the orange to red coloration of its roots and rhizome. Information regarding herbicidal control of Carolina redroot is extremely limited and mostly restricted to blueberry production (Myers et al. 2013). In order to address the issues of successfully managing Carolina redroot under extremely specific environmental and cropping conditions, a study was initiated in the spring of 2017 to evaluate the efficiency of three herbicides at different rates for pre-emergence control of Carolina redroot. A complete lack of control in the twelve weeks that followed the application was noted for the plants that were treated with Norflurazon at 560, 1,120, 2,240, and 4,480 g ai ha^{-1}. Control of Carolina redroot with napropamide applied at 6,720 g ai ha^{-1} was 74% 28 days after treatment (DAT) and increased to 78% at 83 DAT. Greater control was achieved early in the season with dichlobenil applied at 2,240 or 4,480 g ai ha^{-1} with 90 and 99% control, respectively, at 28 DAT. However, control with dichlobenil declined between 28 and 83 DAT. Carolina redroot density in the non-treated plots reached 430 plants m^{-2} 56 DAT but was reduced to 275 plants m^{-2} with napropamide, 95 plants m-2 with dichlobenil at 2,240 g ai ha^{-1}, and 70 plants m^{-2} with dichlobenil at 4,480 g ai ha^{-1}. Significant damages to the cranberry crop were noted with dichlobenil at 4,480 g ai ha^{-1}, mostly in the form of chlorosis early in the season (19% at 40 DAT) and stunting later (15% at 83 DAT).

Breeding for Fruit Rot Resistance: Evaluation of the Next Cycle of Crosses (Bog 8)

Jennifer Johnson-Cicalese, Nicholi Vorsa , James Polashock, Karen DeStefano & Susan Vancho

P.E. Marucci Center for Blueberry & Cranberry Research & Extension, Rutgers University, Chatsworth, NJ

Breeding for fruit rot resistance is a high priority in our cranberry breeding program. Managing the fruit rot disease complex is becoming increasing difficult due to climate stress, a widening distribution, and increasing restrictions on fungicide inputs. In 2011-15, 1624 progeny were evaluated in field plots for fruit rot resistance (FRR), fruit quality and yield. These progeny were from the 1st breeding cycle of crosses made in 2005 & 2006, which included two highly resistant accessions, Budd's Blues and US89-3, two moderately resistant accessions, Cumberland and Holliston, and high yielding cultivars such as Crimson Queen and Demoranville. The very best progeny in this trial were selected based on good FRR, commercially viable yields, berry size and color. For example, one Budd's Blues x Crimson Queen progeny had a 3-yr mean yield of 300 g/ft^2 and good resistance under severe fruit rot pressure. In 2015, these top selections were planted in large plots (10' x 20', 5 replicates, Bog 11) for further evaluation under reduced fungicide input scenarios, under the direction of P. Oudemans. These selections have also been used in crosses, to combine resistance types and make further improvements. The progeny from this next breeding cycle were planted in 5' x 5' field plots in 2014 and 2015 (Bog LW5 & UP5), 2016 (Bog 8, 18 & UP5), and 2017 (Bog UP5 & 4). Over 5000 progeny plots are being evaluated. Last year, fungicides were withheld from the plots planted in 2014 and evaluation for FRR and yield began. Initial results are promising; with progeny showing improved yields and fruit rot resistance. These plots will be evaluated again this September, along with the progeny planted in 2015.

As indicated here, multiple years are involved in making crosses, field plot establishment, and evaluating for fruit rot and yield. To potentially speed up this process, we are concurrently working on identifying genetic markers for resistance genes. In 2015, DNA was extracted from large populations of progeny that were evaluated for FRR. Genotyping-by-sequencing (GBS) was then used to generate markers for development of genetic maps and quantitative trait loci (QTL) analyses. Nineteen QTL markers associated with fruit rot resistance were discovered in our populations; these QTL were distributed on nine of the 12 linkage groups (chromosomes) that are present in cranberry. Three of these QTL matched previously reported fruit rot resistance QTL. Four newly reported QTL found on linkage group 8 (Vm8), which explain between 21 and 33% of the phenotypic variation for fruit rot susceptibility, are of particular interest to our breeding program. These FRR markers will now be tested on other populations. Future generations of progeny can be tested for these QTL at the seedling stage, greatly reducing the number of progeny plots that need to be evaluated in the field. Identifying markers for FRR genes, from different sources of resistance, facilitates future breeding by 'pyramiding' genes for resistance, as well as potentially understanding the mechanisms underlying resistance.

In 2016, we planted a large population of 219 individuals (Bog 8, 18 & UP5). The parents of this population were highly resistant, had good yield and offer three sources of FRR (Budd's Blues, US89-3, Cumberland). This should be an excellent population for testing our genetic markers, identifying new markers, and gaining a better understanding of the genetic and environmental factors of progeny performance; AND potentially resulting in a fruit rot resistant cultivar with acceptable yields under greatly reduced fungicide inputs.

Performance of Welker™ and Haines™ and other advanced selections (Bog 10)

Nicholi Vorsa, Jennifer Johnson-Cicalese, Karen Destefano & Susan Vancho

P.E. Marucci Center for Blueberry & Cranberry Research & Extension, Rutgers University, Chatsworth, NJ

The east half of Bog 10 contains four large plots: the most recently released cultivars Haines (Crimson Queen x #35) and Welker (#35 x NJS9834), and selections CNJ99-52-69 and CNJ99-9-25. Welker is an early ripening cultivar whereas Haines ripens later. Haines is an early-mid season cultivar having anthocyanin (color) development later than early season cultivars, e.g., Crimson Queen, but earlier than Stevens. Other qualities of Haines are: fruit appear to color evenly through the canopy, berries are slightly smaller than Stevens and Mullica Queen (2.2g/berry vs 2.5g and 2.3g, respectively), and exhibit less fruit rot than Stevens. Haines fruit are round, with width often wider than stem to calyx length. Haines and Welker are performing well in trials across cranberry growing regions, e.g., Oregon, Washington, Wisconsin and British Columbia. Welker has exceptional establishment and high early yields, however it is more susceptible to fruit rot and is not recommended for the Northeast growing areas. Haines' yields have reached 800 g/ft2 (which approximates bbl/A) in some regional trials. Haines has consistently less fruit rot than Stevens in Wisconsin and Oregon trials. CNJ99-9-25 (a full sib of Haines) is also performing well in Wisconsin and British Columbia trials. The large plots in this bed are being used for fungicide trials so that appropriate management recommendations can be made to growers.

The west half of Bog 10 contains a series of 3rd breeding and selection cycle crosses derived from 2nd generation cultivars Mullica Queen (MQ), Demoranville (D), Crimson Queen (CQ), Scarlet Knight (SK) and an unnamed selection NJS98-71 (Pilgrim x Ben Lear), and 1st generation cultivars, Pilgrim (P) and Stevens (S), and Ben Lear (BL). Over 1600 progeny were evaluated from these crosses during 2009-2012. In 2013, 17 selections exhibiting very high yield potential: MQ x BL (2), MQ x D (1), MQ x S (1), MQ x SK (3), P x MQ (5), NJS98-71 x MQ (4), and NJS98-71 x S (1) were planted in Bog 10 to be evaluated for productivity, fruit rot susceptibility, season, vegetative vigor, establishment and fruit quality traits, e.g. TAcy, Brix, titratable acidity, phenolics, etc. The first two years of data from these replicated plots show promising yields in many selections. One MQ x SK selection had exceptional TAcy (107mg/100g FW vs. Stevens 23mg/100g FW), and high proanthocyanidin (2.26mg/g vs. Stevens 1.22mg/g). Our breeding program continues to address the changing needs of the cranberry industry, including increasing fruit rot resistance (FRR), climatic adaptation (heat stress), and varieties suited for current major products, e.g., sweetened dried cranberries (SDC). New Jersey's stressful growing environment makes it ideally suited for breeding and selection of adapted cranberry cultivars.

NOTE: Bog 10, as well as the other beds in this section, has been fertilized with liquid fertilizers using boom for the past decade. It appears the fertilizer formula that was applied over this period has resulted in elemental imbalance, i.e., calcium and magnesium tissue levels have been in the deficient range. We are adjusting our fertilization management to remedy these deficiencies.

Identifying and implementing methods for improving berry quality parameters

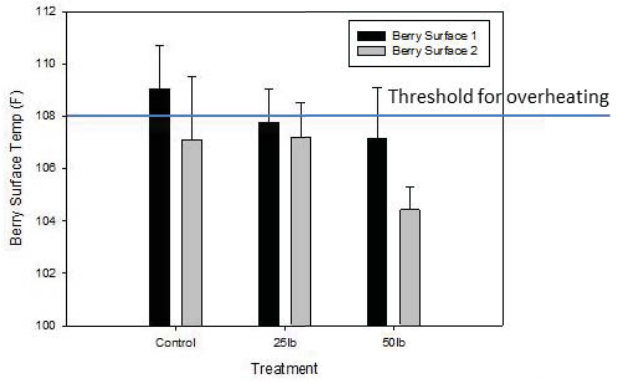
Philip E. Marucci Blueberry and Cranberry Research and Extension Center

Peter Oudemans, Dave Jones, Tim Waller, John Jensen, Tim Jensen, Dan Flath, Chris Constantelos

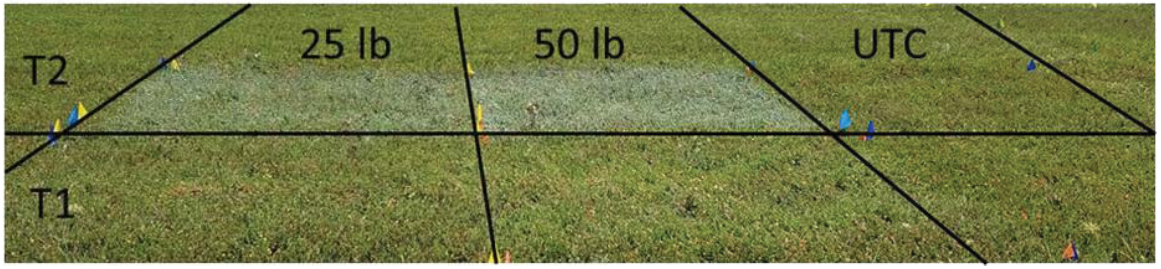
Management for berry quality begins early in the season. Heat stress can occur under a variety of conditions. Berry scald and overheating (cooking) can develop when hot dry conditions exceed the capacity for evaporative cooling from the canopy. Our preliminary results suggest that during the late season (August-September) berry temperatures and canopy temperatures are uncoupled and that average canopy temperatures are misleading because berry temperatures can be much higher. This research will examine the relationship of berry and canopy (leaf) temperatures throughout the season to determine at what timing these tissues become uncoupled. In addition, various treatments will be investigated to determine how temperature of canopy and fruit can be controlled

<u>In Bed Conditions</u>
Relative Humidity 40%
Dew Point ~60°F
Temperature (uncovered) 90°F
Temperature (covered) 85°F
Temperature (in canopy) 90°F

<u>Weather Station</u>
Relative Humidity 31%
Dew Point 39°F
Temperature 83°F



<u>Surround Trial</u>
Two dates, 2 rates
Factors to measure: Berry internal and surface temperature, yield, berry weight, TAcY, Firmness, Poor

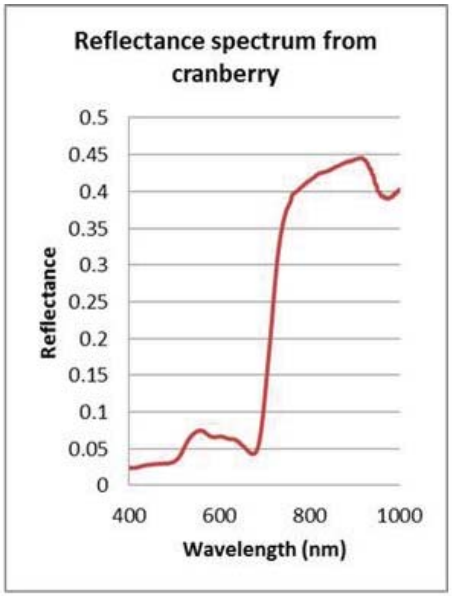


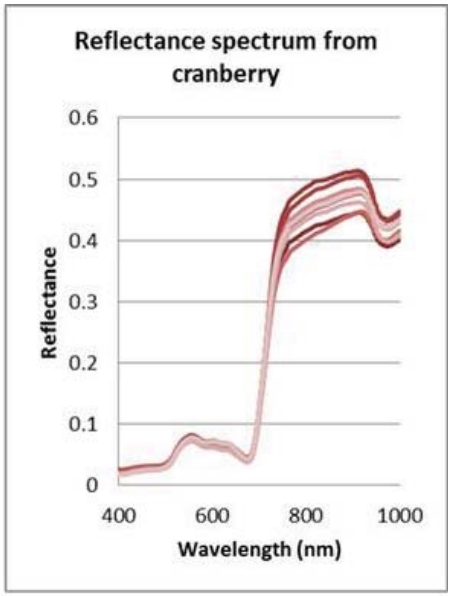
How does mancozeb influence TAcY development?

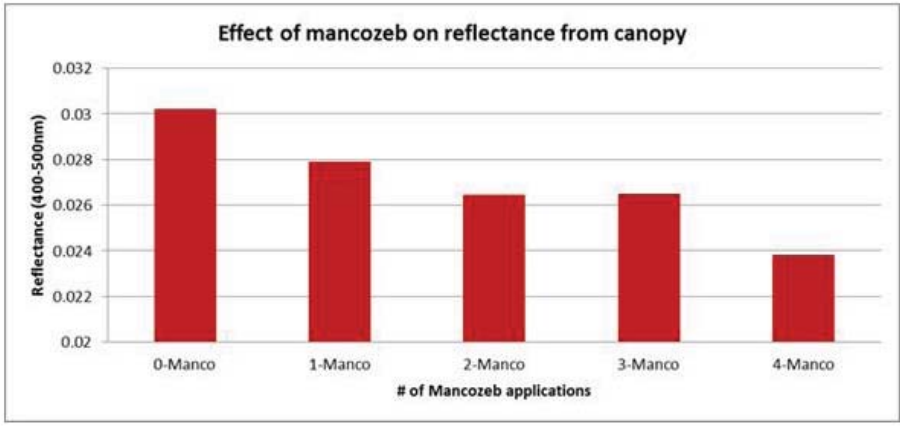
Philip E. Marucci
Blueberry and Cranberry
Research and Extension Center

Peter Oudemans, Dave Jones, Tim Waller, John Jensen, Tim Jensen,
Dan Flath, Chris Constantelos

TRT	9-Jun	16-Jun	22-Jun	7-Jul	21-Jul
1	Pro/Abo	MAN	I/A	Bravo	Bravo
2	Pro/Abo	MAN	MAN	I/A	Bravo
3	Pro/Abo	I/A	MAN	MAN	MAN
4	Pro/Abo	I/A	Bravo	Bravo	Bravo
5	Pro/Abo	I/A	MANKO	MANKO	MANKO
6	Pro/Abo	I/A	MAN-REGA	MAN-REGA	MAN-REGA
7	Pro/Abo	MAN	MAN	MAN	MAN
8	Pro/Abo	-	-	-	-







Is Mycorrhizal Inoculation Efficacious?

James Polashock, USDA-ARS

P.E. Marucci Center for Blueberry & Cranberry Research & Extension, Rutgers University, Chatsworth, NJ

Mycorrhizae are beneficial fungi that form a symbiotic relationship with plants. Colonization is reported to improve nitrogen utilization, increase water and stress tolerance, and increase disease tolerance. American cranberry (*Vaccinium macrocarpon*) is naturally colonized by ericoid mycorrhizae. In New Jersey, the two major species of ericoid mycorrhizae that colonize cranberry are *Rhizoscyphus ericae* and *Oidiodendron maius*. Our preliminary results from 2012 suggested that some locally collected isolates were beneficial to young plantings of Mullica Queen, but plot variation was high and statistical differences could not be demonstrated.

Last year (2016), the experiment size was increased to include two varieties (Mullica Queen and Demoranville, 20 plots of each) and in addition to our locally collected isolates, a commercially available mycorrhizae product was tested. The commercial product is a dried mix of the ericoid mycorhizae, *R. ericae* and *O. maius*. The manufacturer suggests that the product can provide; better nutrition and plant growth, resistance to environmental stress such as drought, some root pathogens and parasites, shock from transplanting etc., and improved uptake of essential elements. There were 5 treatments; 1-Commercial blank (peat mix), 2-Commercial product in peat mix, 3-Perlite blank, 4-*O. maius* isolate grown on perlite, 5-*R. ericae* isolate grown on perlite. Cranberry cuttings were stuck in the greenhouse in 96-well flats. Once rooted, they cuttings were transferred to 48-well flats, at which time the treatment materials were added (10% of soil volume). Treated plants were maintained in the greenhouse for two weeks to allow colonization and then transplanted to the field (24 plants/plot, 4 plots/treatment). Plants were maintained in the field, using standard practices, for about 1 year.

Data were collected from six randomly selected plants (3, 6, 11, 13, 20, 22) from each plot. Data collected include; runner number, runner length, total above ground biomass (FW of shoots), total below ground biomass (FW of roots), number of flowering uprights, number of fruit and weight of fruit. Data were transformed for statistical analyses using ANOVA.

All analyses show there is no significant treatment effect for any of the characteristics measured. Sample plots shown below indicate that variation is high among samples. Nonetheless, none of the treatments stood out as being different and this conclusion is supported by the statistics.

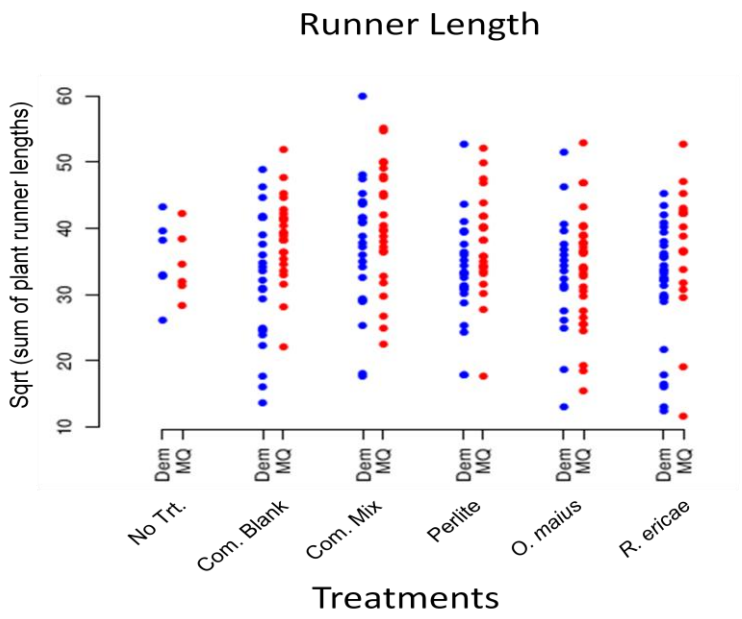
Thus, after 1 year, all of the plots look healthy and the application of commercial mycorrhizae products cannot be recommended at this time. Root samples were prepared and stained with cotton blue for visualization of mycorrhizae. Results show that all plants are colonized regardless of treatment. It appears that after 1 year in the field, plants are naturally colonized by indigenous mycorrhizae. This at least partly explains why there were no significant treatment effects.

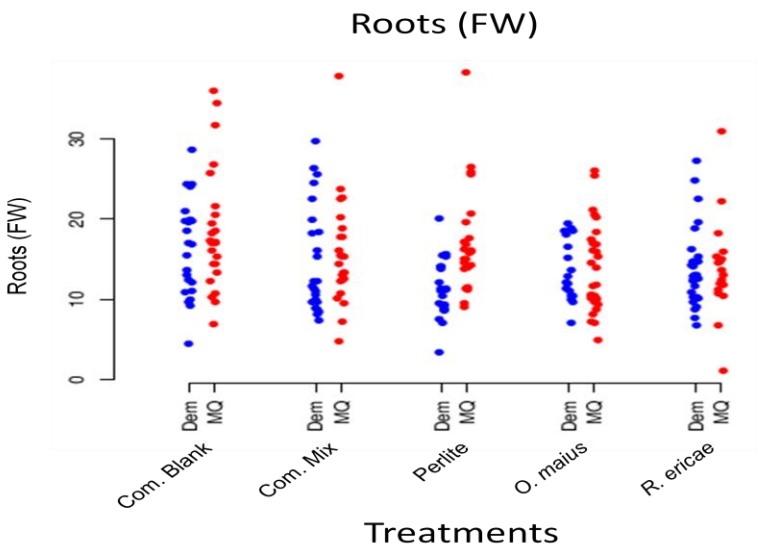
Treatment effects might be more apparent if the beds were first fumigated or if a thick layer of sand was applied to the bed before planting. We will continue this research with varying planting conditions.

Inoculum grown on perlite.

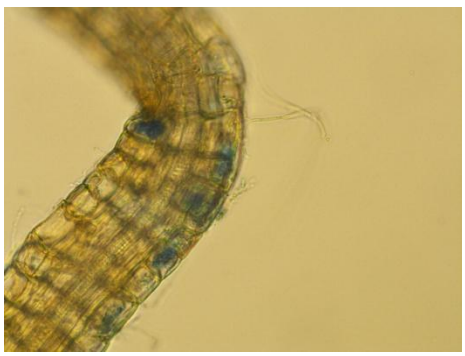
Typical field plot

Typical plant showing above and below ground tissue that was measured.

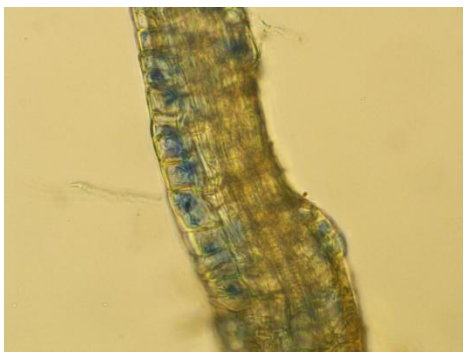




Samples plots showing runner length and fresh weight of roots from treated and untreated plots. Demoranville (blue) and Mullica Queen (red).



Blank peat mix control



Commercial product inoculum

Mycorrhizae are the blue-stained material in the epidermal root cells.

On-going Research on Sucking Insect Pests

Cesar Rodriguez-Saona[1,2], *Vera Kyryczenko-Roth*[2], *Robert Holdcraft*[2], *Nakorn Pradit*[1] (PhD student)

[1]Department of Entomology, Rutgers University
[2]P.E. Marucci Center for Blueberry & Cranberry Research & Extension, Rutgers University, Chatsworth, NJ

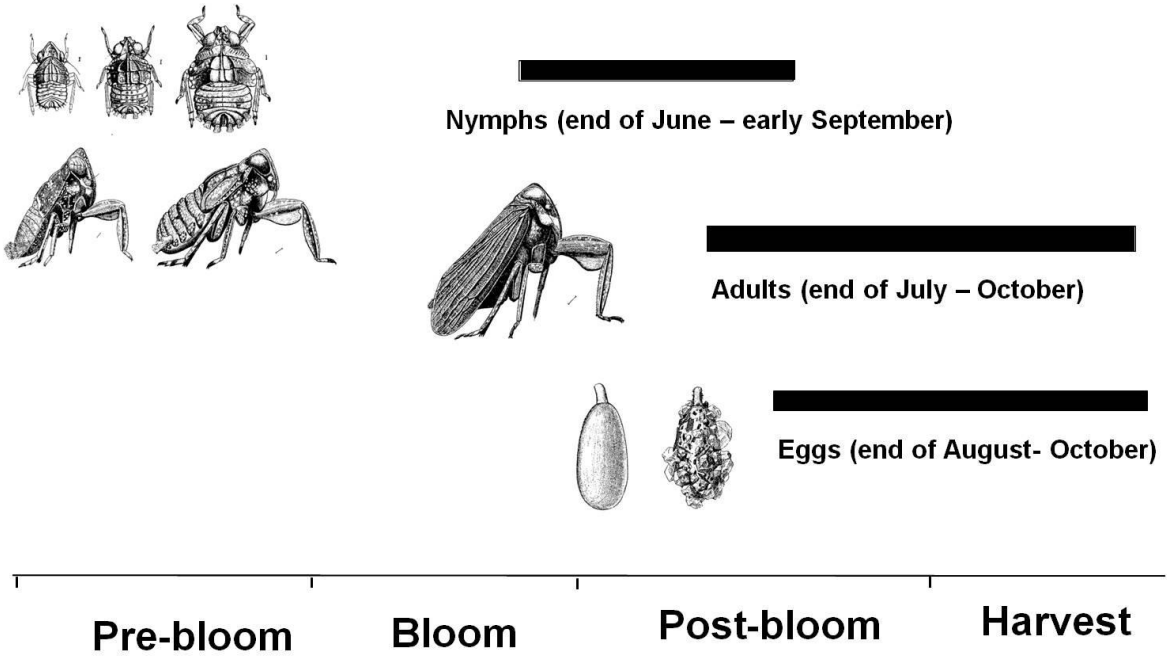
There is concern among cranberry growers of a potential increase in secondary pests, such as the cranberry toad bug, *Phylloscelis atra*, and blunt-nosed leafhopper, *Limotettix vaccinii*, because of recent changes in pest management strategies (e.g., adoption of new reduced-risk products and decreased applications of broad-spectrum insecticides).

The Cranberry Toad Bug

Toad bugs are hemipteran insects (similar to blunt-nosed leafhoppers) but belong to the Family Dictyopharidae (planthoppers) (as opposed to leafhoppers, which belong to the family Cicadellidae). Toad bugs feed only on cranberries. This insect has a single generation per year. It overwinters as eggs.

Based on our studies, nymphs appear by the end of June through early September, and the adults from end of July through October (harvest). Eggs are laid from end of August through October. Feeding damage can be noticed in two stages. First stage feeding damage on vines causes closing in (towards the branch) of the leaves on the new growth. Second stage feeding causes changed in color (reddish to brown) of new growth. The damage can be seen from July until harvest. This damage will cause dying of the branch and the berries to shrivel up. Heavy infestation will result in dwarfed berries. Little information is currently available on the biology, impact, monitoring, and management of cranberry toad bugs.

Life Cycle of cranberry toad bugs



Efficacy of various insecticides against toad bugs

Field experiments were conducted in 2017 to test the toxicity of registered and non-registered insecticides on toad bugs. The following insecticides were evaluated: Diazinon, Sevin, Assail, Agri-Mek, Closer, Lorsban, Cormoran, Beleaf, and compound X. The experiment was conducted in an 'Early Black' cranberry bog located at the Rutgers PE Marucci Center for Blueberry and Cranberry Research and Extension in Chatsworth, New Jersey (see Figure). Plots were separated by a 1 m tall silt fence to prevent movement of insects between plots. Treatment plots were arranged in a complete randomized block design with 4 replicates. Applications were made with a custom boom sprayer on a New Holland 1920 tractor. The sprayer was calibrated to deliver 50 gal of volume per acre at 35 psi. Vacuum sampling was used to monitor nymph and adult toad bugs. Plots were sprayed on 4 August. Pre-spray samples were taken on 2 August, and post-spray samples were taken on 10 August. Numbers of toad bugs were counted (nymphs and adults were combined), with the aid of a magnifying lens.

Effect of damage by toad bugs on cranberry

Little is known on the impact of damage by toad bugs on cranberry yield. This information is important for the development of treatment thresholds. We conducted a study to determine whether toad bug feeding impacts cranberry fruit quality and health by characterizing feeding damage. This experiment started in July and ended on 10August. Cages were placed over cranberry uprights in the field (see picture). Treatments consisted of 0, 5, 10 or 20 toad bugs per cage (n = 5 cages per treatment). At the end of the experiment, berries and foliage were harvested by clipping uprights. To characterize damage, the number of damaged/undamaged uprights and dwarfed/healthy berries will be counted. All berries will be weighed.

False Blossom and Blunt-nosed Leafhoppers

Blunt-nosed leafhoppers are vectors of a phytoplasma that causes false blossom disease in cranberries. This diseases causes abnormalities in flowers including shortened, discolored and streaked petals, enlarged calyx, straighten inflorescence, and abnormal development of floral parts into leaves (phyllody). False blossom imposed a severe threat to the cranberry industry in the US in the 1st half of the last century. However, in the 2nd half of the last century, management of leafhoppers through the development of resistant varieties and effective chemical controls reduced its incidence. Recently, the disease has re-appeared in many NJ cranberry farms due to changes in management practices and the use of new (possibly more susceptible) varieties. To address this issue, we are conducting studies to understand the effects of phytoplasma-infected cranberry plants on resistance to leafhoppers and other insect herbivores. We are asking two main research questions: 1. Are phytoplasma-infected cranberry plants more resistant or susceptible to leafhoppers and other non-vector insect pests? and 2) what are the mechanisms of this resistance/susceptibility? These studies will help identify possible mechanisms of insect pest resistance in cranberries and develop tools for improving control methods against insect vectors and other pests of cranberries.

Phytoplasma-infected cranberry plant (left), and healthy plant (right)

New Jersey Agricultural Statistics

Bruce Eklund, State Statistician

NJ Field Office, National Agricultural Statistics Service
503.308.0404
Bruce.eklund@nass.usda.gov

USDA's National Agricultural Statistics released the 2016 Non-citrus Fruits and Nuts Final Summary noon June 27, 2017. New Jersey growers were third nationally in acres harvested and production. New Jersey growers were second nationally in barrels produced per acre, and average price received.

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

NASS released the forecast for the 2017 crop August 10 at 590,000 barrels. This would be down ten percent from the 2016 final estimate. The national forecast is 9,050,000 barrels, down, down six percent from last year's final.

Thank you to New Jersey producers who contributed to an excellent participation rate for the survey producing these results.

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Root Growth Patterns in Cranberries

Amaya Atucha & Beth Ann Workmaster

Department of Horticulture, University of Wisconsin-Madison

Introduction

Root systems of plants present two primary functions: uptake of water and nutrients, and anchorage. However, secondary functions such as storage, production of growth regulators, interaction with soil microorganisms, and propagation can have a significant impact on the plant's performance. The main goal of this project was to characterize root growth patterns in cranberry vines. Understanding root growth dynamics and how biotic and abiotic factors may alter them will allow growers to adjust production practices (e.g., irrigation, fertilization, agrochemical applications, disease control, etc.) to precise root growth stages, increasing production efficiency, quality, and sustainability, and reducing environmental impacts.

Materials and Methods

A total of 16 minirhizotron root observation tubes (clear cellulose acetate butyrate (CAB), 2" ID, 24" long) were constructed and installed at a 30° angled position in the root zones of selected beds of 'Stevens' and 'GH1' in central Wisconsin during the fall of 2014. During 2015, all beds received an application of Casoron, a pre-emergence herbicide, the first week of May at a rate of 32 lb/ac. During 2016, half of the beds received Casoron the last week of April at the same rate as in 2015. A total of 8 root observational tubes were located in areas where the Casoron treatment (C) was applied, and 8 root observational tubes were located in areas with No Casoron treatment (NC). Root image analysis was performed using WinRhizoTron analysis software (Regent Instruments, Quebec, Canada) and JMP statistical analysis software (SAS Institute, Cary, North Carolina).

Results

2015 Growing Season

New root production started in May 2015 for both cultivars and continued until January 2016 (Fig 1.). During the spring months of May and June, new root production accounted for 4% of the total new root production of the year. A substantial increase in root production was observed after bloom (beginning of July), with a peak in late September for 'GH1' and 1st week of October for 'Stevens'. Root production during the 1st week of July (post-bloom) and the 1st week of October (harvest) accounted for 80% of the new root production of the year. Post-harvest root production was not negligible and accounted for 16% of the total root production of the year.

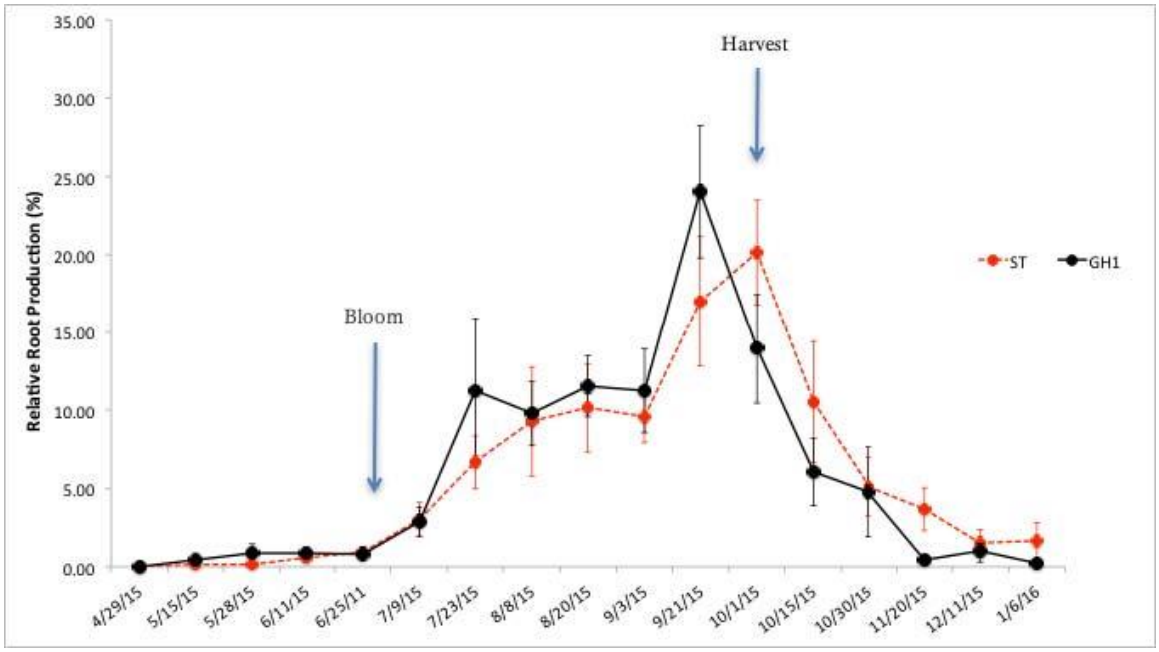

Figure 1. Cranberry root production (%) relative to total new root production during 2015 for 'Stevens' (ST) and 'GH1' varieties.

2016 Growing Season

During 2016, new root production started in the month of June in both treatments, a month later than what we observed in 2015 (Fig. 2). Even though there was a month difference in the initiation of new root growth between 2015 and 2016, in both years new root growth was synchronized with the beginning of bloom. New root production peaked after harvest in the No Casoron treatment (NC), which was also observed in the Casoron treatment (C), however not as major as in the NC treatment. Both treatments continue to produce new roots until late November.

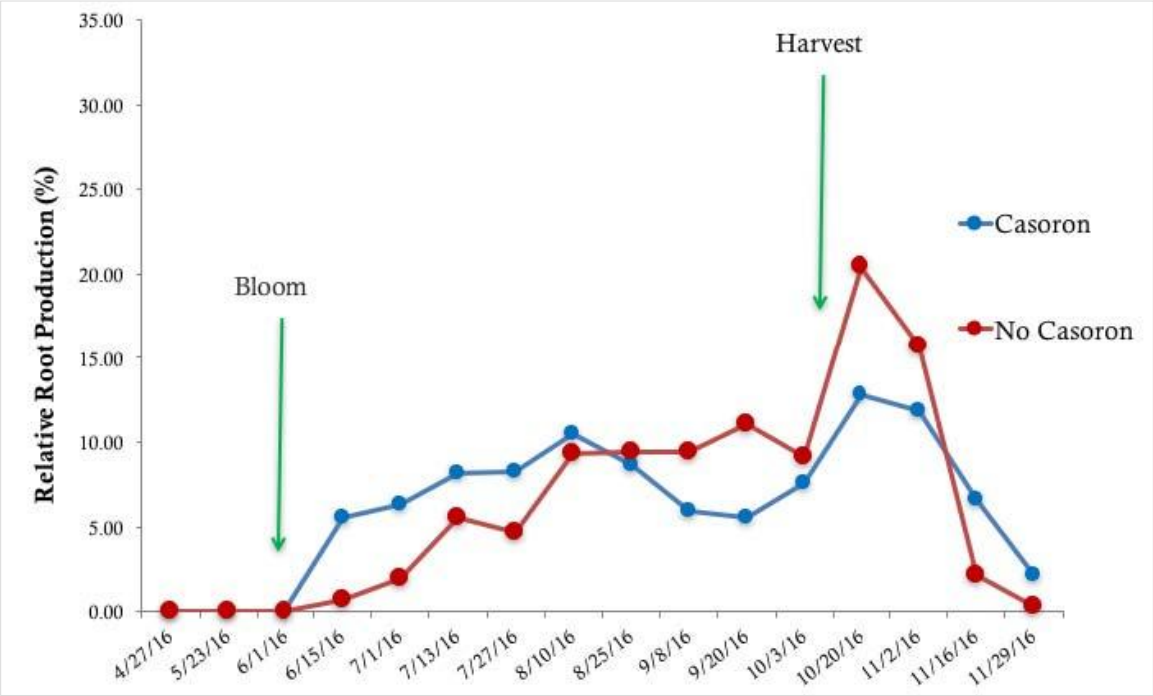

Figure 2. Cranberry root production (%) relative to total new root production during 2016 for 'Casoron' and 'No Casoron' treatments. Casoron was applied during the last week of April.

Summary

A complete set of data for 2015 and a preliminary set of data for 2016 report that new root production in cranberries occurs primarily between fruit set and harvest, which means the initial stages of upright growth, bloom, and fruit set are supported mainly by plant reserves. The highest rate of root production happened during and after harvest, which corresponds to the cessation of vegetative growth on the above ground portion of the plants. Root production and activity extends past harvest into mid-late fall, highlighting the importance of maintaining adequate soil moisture levels during fall, given that roots are still up taking water and nutrients.