

# 2011 Annual Summer Meeting of the American Cranberry Growers Association



**Rutgers University  
Marucci Center**

Chatsworth, NJ

**Thursday  
August 18, 2011**

**RUTGERS**

New Jersey Agricultural  
Experiment Station



**American Cranberry Growers Association  
2011 Summer Field Day  
Thursday August 18, 2011  
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:**

**8:00–8:30 Continental Breakfast (Bog 2)**

**8:30–8:40 Opening Remarks**

*Shawn Cutts*, President, American Cranberry Growers Association

**8:40–9:00 Evaluation of the potential for fumigation in bed establishment (Bog 2)**

*Peter Oudemans*, Department of Plant Biology and Pathology, Rutgers University

**9:00–9:15 Disease control in bed establishment (Bog 2)**

*Peter Oudemans*, Department of Plant Biology and Pathology, Rutgers University

**9:15–9:30 Diversity in cranberry germplasm: identifying fruit rot resistance, unique fruit chemistry, and growth habit (Bog 1)**

*Nicholi Vorsa*, Professor, *Jennifer Johnson-Cicalese*, Research Associate, Department of Plant Biology and Pathology, Rutgers University

**9:30–9:50 Temperature and soil moisture recording: A demonstration (Bog 2)**

*Kevin Connolly*, president, KC Enterprises Ltd.

**9:50–10:05 Inoculation procedures for cranberry fruit rot resistance screening (Bog 4)**

*James Polashock*, Research Plant Pathologist, USDA-ARS

**10:05-10:20 Update on cranberry establishment methods (Bog 9)**

*Jennifer Johnson-Cicalese*, Research Associate, *Nicholi Vorsa*, Professor, Department of Plant Biology and Pathology, Rutgers University

**10:20-10:35 IR-4 trials - 2011 (Bog 19)**

*Tom Freiburger*, IR-4 Field Research Director, Rutgers Fruit Research Center

**10:35-10:55 2011 Entomology research: leafhoppers, fruitworms, and more (Bog 19)**

*Cesar Rodriguez-Saona*, Department of Entomology, Rutgers University

**CONFERENCE ROOM:**

**11:10–11:20 2011 Cranberry statistics – An update**

*John Gibbons, USDA, NASS*

**11:20–11:35 Announcement: American Cranberry Grower Association**

*Joe Darlington, ACGA Board of Directors*

**11:35–11:45 Announcement: NJ Ag. Experimental Station**

*Brad Hillman, Associate Director for Research (NJAES)*

**11:45–12:00 Cranberry Marketing Committee: Upcoming meeting strategic plan**

*David Farrimond, CMC*

**12:00–1:15 LUNCH**

**1:15–1:30 CALLISTO Use in Cranberries**

*Brad Majek, Department of Plant Biology and Pathology, Rutgers University*

**1:30–2:00 Subsurface Drainage and Tools in Irrigation Management**

*Brian Wick, Cape Cod Cranberry Growers' Association, and Peter Jeranyama, University of Massachusetts*

**2:00–2:30 Pesticide Applicator Safety**

*Ray Samulis, Cooperative Extension Agent, Burlington County Extension, Rutgers University*



# Evaluation of the potential for fumigation in bed establishment

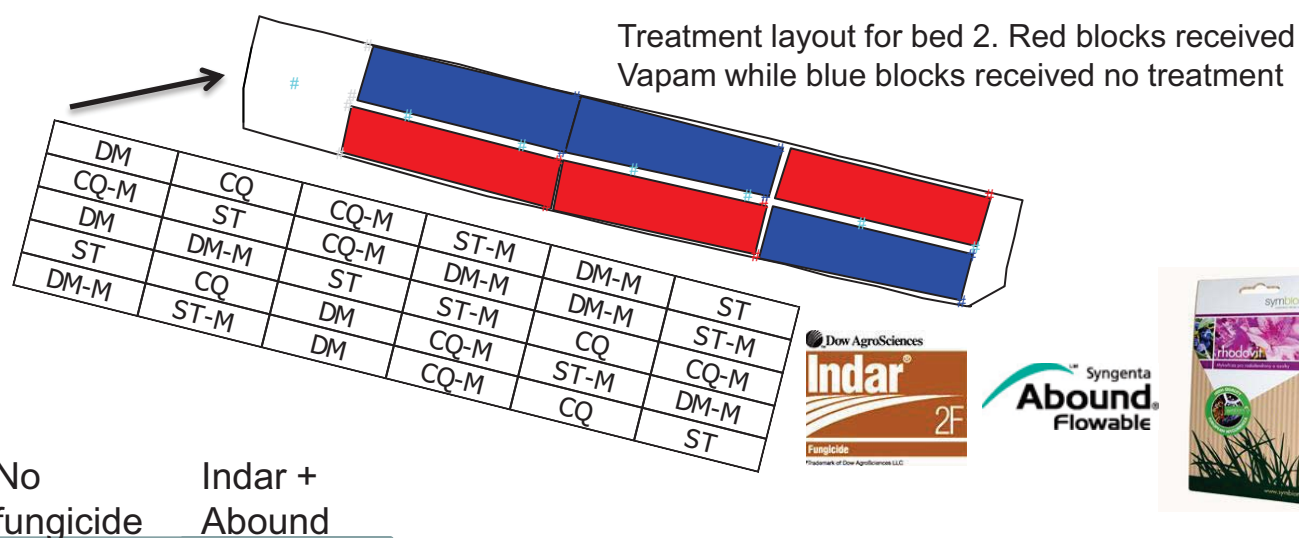
## Evaluation of mycorrhizae and fungicide treatments on vine establishment

Peter Oudemans, Jen Vaiciunas, Rich DeStefano, Chris Constantelos, Donna Larsen

**Objective:** To compare establishment of cranberries with or without fumigation

**Rationale:** Fumigation provides a partially sterilized soil for planting that may increase establishment

**Approach:** Vapam applied on May 1, 2008. Beds planted on May 19, 2008 using rooted cuttings.



No fungicide	Indar + Abound
Cultivar - Mycorrhizae	
Cultivar + Mycorrhizae	

Rhodovit is a commercial product developed for cranberry to improve water and nutrient uptake. We wanted to know if fungicide use during establishment could affect mycorrhizal infection and reduce establishment rate? Three cultivars were planted from rooted cuttings in June, 2008 with or without mycorrhizae. Half of each plot was treated with Indar plus Abound for fruit rot control.

Application of Vapam increased rate of establishment. In 2011 (year 4) visible differences in canopy development are evident. Mycorrhizal treatments did not affect establishment (positive or negative). Fungicide applications increased flower development and yields significantly.

# Disease control in bed establishment

Peter Oudemans, Chris Constantelos, Jen Vaiciunas and Chris Adams

**Objective:** To evaluate establishment with cultivars and fungicide treatments

**Rationale:** Distinct differences in growth rate using the new generation of fungicides has been noticed.

**Approach:** Beds were planted using rooted cuttings in the fall of 2010. All plots were fertilized equally. Fungicide treatments were initiated on June 15, 2011 and plots were evaluated on July 26, 2011

#35	#35	MQ	MQ
#35	#35	MQ	MQ
BL	BL	#35	#35
BL	BL	#35	#35
HO	HO	DM	DM
HO	HO	DM	DM
GH	GH	HYR	HYR
GH	GH	HYR	HYR
ST	ST	ST	ST
ST	ST	ST	ST
EB	EB	HO	HO
EB	EB	HO	HO
CQ	CQ	EB	EB
CQ	CQ	EB	EB
MQ	MQ	GH	GH
MQ	MQ	GH	GH
DM	DM	CQ	CQ
DM	DM	CQ	CQ
HYR	HYR	BL	BL
HYR	HYR	BL	BL



## Results

Cultivar	Cover	Rep	Cover	Treatment	COVER
GH	34.0 A	Bog 20 S	38.5 A	Indar/Abound	30.9 A
DM	32.2 AB	Bog 20 N	34.2 B	Indar/Abound/Phytophthora	30.5 AB
ST	31.8 AB	Bog 13 N	23.1 C	Untreated control	26.9 B
EB	31.2 AB	Bog 13 S	21.3 C	Bravo/Dithane	26.9 B
MQ	28.7 AB				
HO	27.3 B				
CQ	26.3 B				
#35	26.2 B				
BL	25.9 B				

Small differences in the growth of cultivars, treatments were recorded. Very significant differences were observed between replications. This project will continue for three more seasons. We will investigate development of canopy, effect of phytophthora root rot and varying nutritional demands under the different treatments.

## **Diversity in cranberry germplasm: identifying fruit rot resistance, unique fruit chemistry, and growth habit**

*Nicholi Vorsa and Jennifer Johnson-Cicalese, P.E. Marucci Center for Blueberry & Cranberry Research & Extension, Rutgers University, Chatsworth, NJ 08019*

At the heart of every plant breeding program is the germplasm collection. The germplasm represents the genetic variation, i.e., gene pool of the species, which provides for the potential to utilize new genes in the development of new genetic combinations. The more genetically diverse the germplasm, the greater the opportunity to identify and use genes of horticultural importance. The most obvious genes of interest are related to yield, plant vigor, fruit quality, disease and insect resistance. Being a native of North America, the American cranberry (*Vaccinium macrocarpon*) distribution covers southeastern Canada, south along the east coast to Delaware, and west to eastern Minnesota. In 1985, the Rutgers cranberry breeding program began gathering the most genetically diverse cranberry germplasm collection possible to fuel the breeding program. The germplasm consists of varieties that were domesticated by the industry from as far back as 1843 (e.g., cv. Howes), genetic variants that developed in cultivated beds many decades old, and native varieties from wild bogs and marshes in a diverse range of habitats. Over 600 accessions were collected from throughout the U.S. (NJ, NY, MA, DE, WV, PA, MI, and WI). In addition, germplasm of related small-fruited cranberry species, *Vaccinium oxycoccus*, were collected from Alaska and far eastern Russia and are being maintained at the Center.

This collection was planted in 1995 in 5' x 5' field plots and has been studied and used extensively in the breeding program. Within it, genetic variation has been identified for fruit rot resistance, fruit sugars, acids, fruit anthocyanin and proanthocyanidin content, vegetative anthocyanins, and other traits of interest. In the past few years, it became apparent that despite our efforts to maintain genetic purity, the field planting (Bogs 1 & 4) showed signs of contamination. So, in 2007 to re-establish the collection, we selected one piece of vine with fruit attached that looked most typical to the plot. These individual vines were DNA fingerprinted to confirm their identity, propagated and then replanted in a new 5' x 5' plot in Bog 1 in April 2010. In addition, recent accessions were included in this planting. Once established, these new plots will continue to serve as a resource to researchers here at Chatsworth and around the country.

As an example of how this collection has been utilized, in 2003 and 2004, fungicides were withheld from the germplasm collection and the plots were screened for field resistance to fruit rot. Most of the 560 accessions screened had severe fruit rot (over 90% rotten fruit), while less than 20 accessions showed some level of resistance. These resistant accessions have now been used in many crosses with the goal of developing a commercially-viable fruit rot resistant cultivar. They are also being studied to identify possible mechanisms of resistance and molecular markers for resistance.

Other evaluations include extensive testing of fruit chemistry. When tested for Brix (a measure of soluble solids, primarily sugars), the collection ranged from 6.2% to 11.8%; the range in glucose values was 1.3-6.6%, and in fructose, 0.1-3.2%. Acid levels also exhibited a wide range in values, from 1.4-3.0% titratable acidity. Total phenolics, a group of compounds associated with plant defense and human health, ranged from 1848-9003 ppm. This diversity in fruit chemistry represents an opportunity to develop cranberry cultivars with unique characteristics. Thus, crosses have been made for higher sugars, total phenolics, as well as high

proanthocyanidin, and high and low anthocyanin. Progeny from these crosses have been evaluated and incorporated into further crosses. Evaluation of this collection has also given us a better understanding of traits such as yield, fruit size, fruit number, fruit chemistry and growth habit, and how they are correlated. We are now developing a map of the cranberry genome, which will help us sort out relationships among accessions, and the possibility of identifying markers for traits of economic importance.



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## Irrigation Automation



## INOCULATION PROCEDURES FOR CRANBERRY FRUIT ROT RESISTANCE SCREENING

James J. Polashock, Nicholi Vorsa, and Jennifer Johnson-Cicalese

Fruit rot is the primary threat to cranberry (*Vaccinium macrocarpon*) production in the northeastern US and is an increasing problem in other growing areas. Cranberry fruit rot is incited by a complex of fungi from at least 12 genera. Despite the wide array of causal agents, we have identified a few accessions that exhibit field fruit rot resistance (FFRR). Resistant selections were used in crosses and the progeny (512 clones) were planted in the field. These progeny were evaluated for FFRR after exposure to natural inoculum. Although determination of 'general' field resistance is desirable, a method to evaluate fruit for resistance to specific pathogens is needed. The ultimate goal is to develop new cranberry varieties with superior field fruit rot resistance (FFRR). The objective addressed here is to develop a reliable method of screening selected progeny for resistance to specific fruit rot inciting pathogens. A number of application methods were tested including inoculation on paper disks, inoculation in carriers such as sorbitol and lanolin, and inoculation using infested toothpicks. Only the toothpick inoculation procedure showed promise. Five common fruit rot fungi were selected for testing (*Coleophoma empetri*, *Colletotrichum acutatum*, *Colletotrichum gloeosporioides*, *Phyllosticta vaccinii*, and *Physalospora vaccinii*). Wooden toothpicks were sterilized, saturated with potato-dextrose broth, and colonized with representative isolates of each fungal species. The tips of the infested toothpicks were inserted into green fruit. Progression of fruit rot was measured 8-14 days after inoculation. The toothpick inoculation method generally showed susceptible lines to have more rot. However, this was not always the case and varied with fungal species. In some cases, production of anthocyanin was evident at the wound site, which may be an indication of a resistance response. We are confident that this method will allow a more precise identification of resistance across a wide array of germplasm.

## Update on cranberry establishment methods

*Jennifer Johnson-Cicalese and Nicholi Vorsa*, P.E. Marucci Center for Blueberry & Cranberry Research & Extension, Rutgers University, Chatsworth, NJ 08019

With the release of a new cranberry variety, there is limited availability of plant material, and the need to maintain genetic purity, making traditional planting methods (using 1-2 tons of vine/acre) limiting. Thus in 2007, two replicated trials were planted to test the potential of alternative establishment methods using Mullica Queen and Crimson Queen. The methods tested are described in Table 1 and used both rooted and unrooted cuttings, and from 27 to 440 lbs of vine/acre.

**Table 1. Establishment Study with Mullica Queen (Bog 5) and Crimson Queen (Bog 9)**

<b>Treatments</b>	<b>Planting method</b>	<b>Planting date</b>	<b>Cuttings per ft<sup>2</sup></b>	<b>Size of cutting</b>	<b>lb of vine per acre</b>
<b>Unrooted cuttings:</b>					
Sticks-2	Cuttings stuck upright into holes on bed surface	25-Apr-07	2	6"	110
Sticks-4	Cuttings stuck upright into holes on bed surface	25-Apr-07	4	6"	220
Layed-out	Layed horizontally on surface in a row and pressed in with modified disk	25-Apr-07	6	8"	440
Sprinkled	Sprinkled over plot and pressed in with modified disk	25-Apr-07	6	8"	440
<b>Rooted cuttings:</b>					
Rooted-1	Hand planted	31-May	1	3"	27
Rooted-1.5	Hand planted	31-May	1.5	3"	41
Rooted-June	Hand planted	26-Jun	1	3"	27

By August of 2007, differences in cover and amount of new growth were evident. ‘Layed-out’ and ‘Sprinkled’ had better establishment than ‘Sticks’, primarily because of the poor soil/cutting contact with the ‘Sticks’ method. With rooted cuttings, establishment was more uniform than with unrooted cuttings, and generally better, even though planted 1-2 months later. The ‘Rooted-June’ treatment had an equal amount of growth as the May plantings, indicating that the later planting date had little effect on establishment.

In 2009, two years after planting, fruit samples of 1 ft<sup>2</sup> were harvested from each plot in September and October, and significant differences between planting methods continued to be found. With Mullica Queen (Bog 5), the ‘Sticks’ treatments had lower yield, while the ‘Layed-out’, ‘Sprinkled’ and ‘Rooted’ treatments all had essentially the same yield (Figure 1a). Crimson Queen had a greater range in yield, with rooted cuttings yielding higher than other treatments, ‘Layed-out’ and ‘Sprinkled’ having moderate yield, and ‘Sticks-2’ having the lowest yield (Figure 1b).

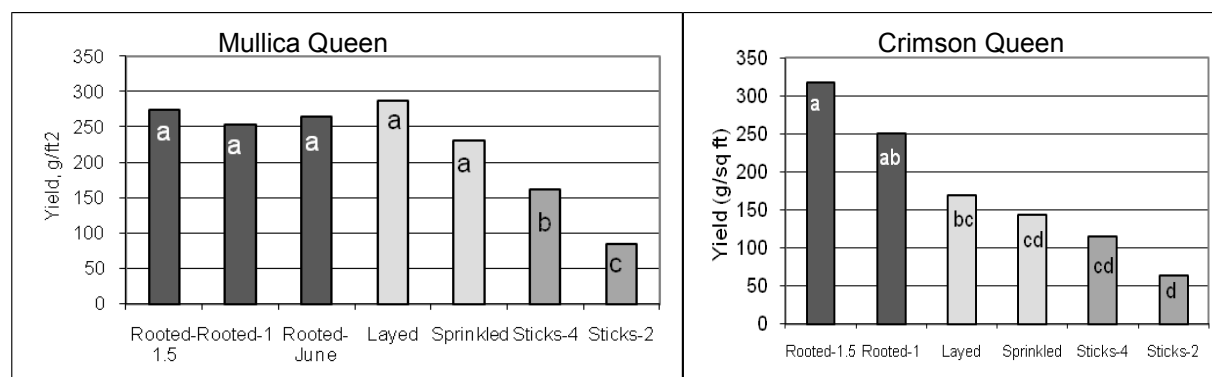


Figure 1a & 1b. Cranberry fruit yield (g/ft<sup>2</sup>) comparing seven different planting methods two years after planting, using the varieties Mullica Queen and Crimson Queen.

The cost of rooted cuttings is slightly higher than unrooted cuttings, but this data suggests better establishment and higher earlier yields, which would make up the initial expense. The small quantity of plant material needed with rooted cuttings (27 lbs/acre) allows for careful scrutiny of the material for maintaining genetic purity. The 'Sprinkled' treatment may have potential because it is similar in labor requirements to the conventional planting method, except the vine was cut up into 8" pieces allowing for better contact of vine with soil, and uses less than 1/4 ton of plant material. Although the Mullica Queen 'Layed-out' treatment did very well, it was so time-consuming to plant that it would only be practical if automated in some way. In 2010, three years after planting, yield was visually estimated and differences between treatments were no longer evident.

## 2011 ENTOMOLOGY RESEARCH: LEAFHOPPERS, FRUITWORMS, AND MORE

**Cesar Rodriguez-Saona, Robert Holdcraft, Dan Schiffhauer, and Vera Kyryczenko-Roth**

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

Here are the entomology highlights of this year's cranberry season:

- Early in the season, some farms experienced areas of high blackheaded fireworm and *Sparganothis* fruitworm that required treatment.
- Some growers also reported areas of high blunt-nosed leafhopper and grub infestations. It is also important to continue to monitor for these secondary pests in upcoming years. This is particularly important because many of the newer “reduced-risk” insecticides are very selective and effective only against lepidopteran pests but have minimal or no insecticidal effects against other insect pests (e.g. beetles, leafhoppers, etc.).
- There are a few new insecticides registered in cranberries: Belay, Oberon 2SC, and Rimon 0.83EC. However, we have limited information on maximum residue levels (MRLs) for them. These levels are critical when exporting cranberry products. Thus, at this point, these products have limited use in New Jersey cranberries. Also, more efficacy trials need to be conducted with these insecticides against important cranberry pests in New Jersey.
- I am aware of some growers that used Delegate this season. I will continue to encourage growers to use this product. Delegate is an excellent insecticide for the control of Lepidopteran pests, including fireworms and fruitworms.

### On-going Research Projects

#### Development of a degree-day model to better time insecticide sprays against *Sparganothis* fruitworm

*Sparganothis* fruitworm is considered a key direct insect pest of cranberries in New Jersey. We are working on the development of a degree-day model to better time applications of reduced-risk insecticides against this pest. Male captures in pheromone traps are being used as our biofix, i.e., start of degree-day accumulations. In 2011, male flight activity was monitored daily in four commercial cranberry farms. Traps baited with pheromone lures were placed at 4 cranberry bogs per farm to establish a biofix. Daily minimum and maximum temperatures were collected by placing weather sensor units in each experimental bog. In addition, pairs of adult males and females were placed inside plastic cages in each of the bogs (Picture 1). Time of egg laying was monitored daily to determine time between first male capture and first eggs laid. Similarly, freshly laid eggs were placed in each bog. Eggs were monitored daily to determine time between first male catch and egg hatch. Finally, neonates were placed with field-collected fruit and foliage in small plastic containers in the laboratory to determine the time between egg hatch and larval entry into fruit.

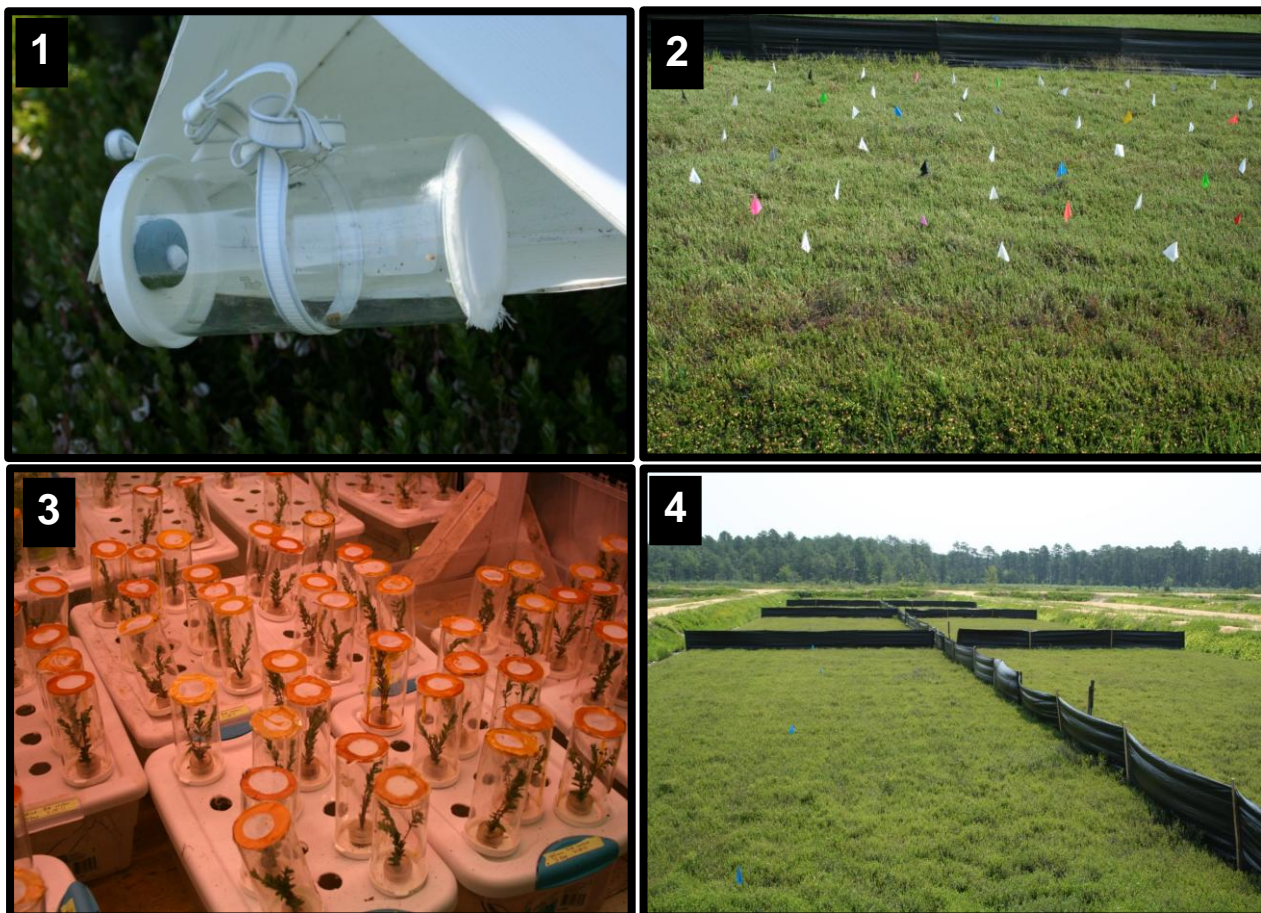


Compare the toxicity of new insecticides on *Sparganothis* fruitworm larvae.

In 2011, semi-field experiments were conducted to determine the toxicity of registered and non-registered insecticides against *Sparganothis* fruitworm. Foliar applications of Lorsban, Assail, Delegate, Intrepid, Rimon, and the 2 unregistered diamides were applied to small (4-by-4 feet) cranberry plots (Picture 2). Residual toxicity of different insecticides was evaluated by placing neonates and 3rd instars *Sparganothis* fruitworm on field-weathered foliage residues collected 3, 7, 14, and 21 days after treatment. On each of the sampling dates, five insecticide-treated uprights were inserted in florists' water picks, enclosed in a ventilated 40-dram plastic vial, and secured in Styrofoam trays (Picture 3). Each replicate consisted of 10 vials per treatment. Five neonates or one 3rd instar larva were placed individually in a vial. Plants and insects were placed in the laboratory at 25°C. Mortality and larval weights were assessed 7 days after transfer.

Determine the effects of pre-bloom insecticide applications for blunt-nosed leafhopper control under field conditions

Assail, a neonicotinoid recently registered for use in cranberries that provides excellent control of many sucking and chewing pests and is relatively safe to bees (as compared to other neonicotinoids), Imidan, and Lorsban at different rates (1X, 1/2X, and 1/4X) were tested against leafhoppers under field conditions (Picture 4). Nymphal densities were assessed by sweep net sampling before and after treatment.



## Cranberry Economic-Profit Model

- Rutgers University has developed an Economic-Profit model
  - For use by all cranberry growers
  - Can very quickly allow growers to compare bed renovation options for any 2 choices
  - Allows easy change to a few key input variables
  - Provides instantaneous data on comparative return on investment and cost-benefits
- Growers can use pre-inserted data, or insert their own data for the following
  - Yield (bbls/acre)
  - Selling price (\$/barrel)
  - Field conversion cost (\$/acre)
  - Material cost (\$/acre)
  - Several other lesser cost factors
- Results appear in graphical and chart format on one printable page
- Visit <http://cranberry.rutgers.edu/> ; enter or accept data, click 'Update Results'
- See next page for example input – output page
- Questions? Contact Rutgers at: Leon Segal, 732-932-0115 x2106; [segal@otc.rutgers.edu](mailto:segal@otc.rutgers.edu)

## Cost-Benefit Analysis

Below is a list of variables (i.e., yield, price, and costs) that you may use to calculate the return on investment of renovating a one-acre field. You may also input information specific to your own farm. Click on the "Update Results" button when you are ready to see your return on investment.

Variety:	<input type="text" value="Rutgers Mullica Queen"/>	<input type="text" value="Stevens"/>
Other Variety Name:	<input type="text" value="N/A"/>	
State/Region:	<input type="text" value="NJ"/>	<input type="text" value="NJ"/>
Yields (bbls/acre):	<input type="text" value="400"/>	<input type="text" value="300"/>
Price (\$/bbl):	<input type="text" value="50"/>	<input type="text" value="50"/>
Field Conversion Cost (\$/acre):	<input type="text" value="20000"/>	<input type="text" value="20000"/>
Shipping Cost (\$/acre):	<input type="text" value="100"/>	<input type="text" value="100"/>
Materials Cost (\$/acre):	<input type="text" value="10000"/>	<input type="text" value="5000"/>
Licensing Cost (\$/acre):	<input type="text" value="1500"/>	<input type="text" value="0"/>
Variable Cost of Production (\$/acre):	<input type="text" value="3300"/>	<input type="text" value="3300"/>
Percent Yield in Year 3 (%):	<input type="text" value="60"/>	<input type="text" value="60"/>
Percent Yield in Year 4 (%):	<input type="text" value="100"/>	<input type="text" value="100"/>
	<input type="button" value="Reset"/>	<input type="button" value="Reset"/>

After inserting your chosen data, just click on Update Results, and you will see graphical and tabular data, readily printable. Detailed Data can be obtained by clicking Print Detailed Results button.

Since the model is meant to be comparative, assumptions that are equal for the 2 data sets compared will not greatly affect the comparative results.

\* All other costs assumed equal for Rutgers and other varieties.

### Cost Benefit Results

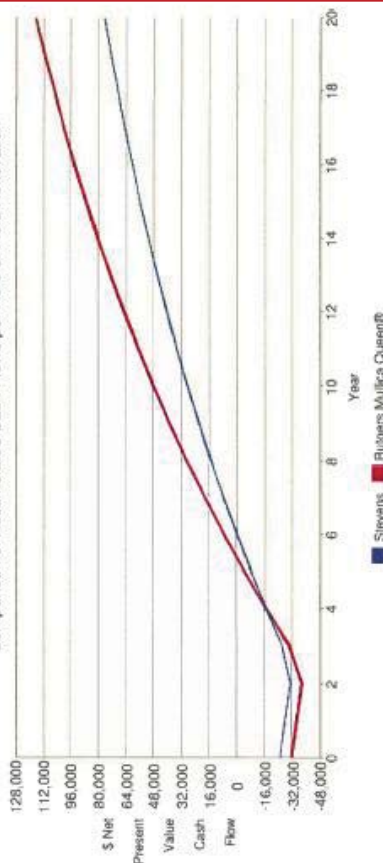
## Data Assumptions Used:

Variety:	Rutgers Mullica Queen®	Stevens
State/Region:	NJ	NJ
Yields (bbls/acre):	400	300
Price (\$/bbl)	50	50
Field Conversion Cost (\$/acre):	20,000	20,000
Shipping Cost (\$/acre):	100	100
Materials Cost (\$/acre):	10,000	5,000
Licensing (\$/acre):	1,500	0
Variable Cost of Production (\$/acre):	3,300	3,300
Yield in Year 3:	60%	60%
Yield in Year 4:	100%	100%

### Cost Benefit Results

Variety:	Rutgers Mullica Queen®	Stevens
Net Present Value of Accumulative Cash Flow(\$):	116,563	76,559
Equal Cash Flow (year):	4	
Breakeven Point (year):	5.4	6
10-Year Return on Investment for Conversion:	186%	158%

Comparison of Accumulated Cash Flows per Acre of Field Renovation





## Subsurface tile drainage effects in cranberry production

*Peter Jeranyama<sup>1</sup>, Brian Wick<sup>2</sup> and Jesica M. Sack<sup>1</sup>*

<sup>1</sup>UMASS Cranberry Station, 1 State Bog Road, P.O. Box 569, East Wareham, MA 02538;

<sup>2</sup>Cape Cod Cranberry Growers' Association, 1 Carver Square Boulevard, P.O. Box 97, Carver, MA 02330

Subsurface or tile drainage removes excess moisture from the soil. This excess water prevents air and oxygen from getting to the plant root zone. Without artificial drainage, plants have difficulty establishing a healthy root system on poorly drained soils. Subsurface drainage provides the mechanism for these soils to drain to field capacity in a reasonably short period of time so that plant growth is not significantly impaired. Cranberry bogs with excess soil moisture have been associated with loss of fruit quality due to increased fruit rot, decreased crop production and poor fruit set. The Cape Cod Cranberry Growers' Association received a Conservation Innovation Grant from the USDA Natural Resources Conservation Service to evaluate the effect of subsurface tile drainage spacing on cranberries and to measure upright density, carbohydrate content in the uprights, fruit yield and quality. Subsurface drainage tiles were installed at three different distances apart from each other (15, 20 and 30 ft) and at a depth of 1 ft below the soil surface. Cranberries grown under subsurface drainage tiles installed at 15-ft apart had the least total upright density (321; 454; 463 uprights ft<sup>-2</sup> for 15, 20 and 30-ft respectively) and yield. While the highest yield of 340 barrel/acre was obtained at 20-ft apart, fruit yield of 307 barrel/acre obtained at 30-ft tile spacing was not significantly different from the 20-ft spacing. Optimum fructose concentration of 1.7 % was obtained at a subsurface drainage tile spacing of between 20 and 30-ft. There was no advantage of reducing subsurface drainage tiles from 30 to 20-ft with respect to crop performance; however a spacing of 15-ft resulted in significantly reduced crop performance and yield.