New Jersey Department of Agriculture
Specialty Crop Block Grant Agreement # 12-25-B-0869
Final Report

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Submitted by:

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Project Title;
"Projects designed to control the spread of cranberry plant disease"

Project Summary;
The purpose of this project is to investigate fungicide efficacy for fairy ring disease in cranberry plants, determine how it spreads, develop a pathogenicity test and screen a cranberry germplasm for existence of resistance to this disease and investigate the possible existence of hypovirulent strains of the fungus.

Fairy ring is a disease of unknown etiology that cases significant loss to cranberry farmers. New rings form on individual cranberry beds at a rate of 1 – 3 per year, and the disease can spread to new beds where it was not present the previous year.

The area affected by the disease doubled from 2003 to 2008.

At the beginning of this project there were no effective methods of controlling this disease. As a result of this project the effectiveness of a variety of fungicides on fairy ring was tested.

Project Approach

Objective 1; Investigate fungicide efficacy for reducing ring expansion.

Plate tests were completed using nine fungicides. Results indicate that the Sterol Inhibiting fungicides are most active and there is some variation among types. Results in field trials were not well correlated with plate tests with the exception of Prostar which was nontoxic on plates and showed no effect in field trials. Two materials were tested in field trials (Quash and Pristine) were the most consistent in reducing expansion of the diseased area. Surprisingly, Proline was effective in one trial and not the other and Elite was not effective in either. These materials were the most toxic in plate assays.

Trade Name	Active Ingredient	FRAC Group	Water Solubility (ppm)	EC50 Range	Field Efficacy	
					Trial 1	Trial 2
Topguard	Flutriafol	3	130	1-10	-	-
Endorse	Polyoxin D	19	35000	No effect	NT	NT
Abound	Azoxystrobin	11	6	1-10	NT	NT
Elite	Tebuconazole	3	36	0.1-1	-	-
Enable	Fenbuconazole	3	3.8	1-10	-	-
Omega	Fluazinam	29	0.135	No effect	NT	NT
Proline	Prothioconazole	3	300	0.1-1	+	-
Prostar	Flutolanil	7	8	No effect	-	-
Topsin M	Thiophanate methyl	1	-	1-10	-	-
Quash	Metconazole	3	30.4	NT	+	+
Pristine	Pyraclostrobin + Boscalid	11 7	1.9 4.6	NT	+	+

Objective 2; Determine how the pathogen spreads within and between cranberry beds. .

Extensive testing of isolates from within a ring and between rings has confirmed that isolates collected from the same ring are of the same genotype while isolates collected from different rings are often distinct. We have found cases where neighboring rings are the same genotype and this is likely due to movement of sclerotia by machinery. Isolates collected from rings in different beds were always distinct genotypes. It is becoming increasingly clear that there are two distinct phases in this disease and control of the primary phase will help reduce disease spread and should be relatively easy whereas control of the soil phase (Phase 2) is much more costly and difficult.

Objective 3; Develop a pathogenicity test and screen a cranberry germplasm for existence of resistance to this disease.

Disease has been reproduced under greenhouse conditions however expression is variable and results are inconsistent.

Objective 4; Investigate the possible existence of hypovirulent strains of the fungus.

Isolates possessing dsRNA were identified and characterization is proceeding. However, based on the discovery that formation of new rings is dependent on sexual reproduction it is likely that this approach will be most effective in treating individual rings.

Objective 5; Extension and outreach plan.
The results described above were incorporated nto an extension bulletin published by Rutgers, The New Jersey Agricultural Experiment Station which can be found here;

http://njaes.rutgers.edu/pubs/plantandpestadvisory/2011/cb041411.pdf

Dr. Peter Oudemans supervised the project with support from the staff at the Philip E. Marucci Center for Blueberry and Cranberry Research & Extension (609-726-1590).

Bradley A. Majek, Ph.D., Weed Science
Peter Oudemans, Ph.D., Plant Pathology
Cesar Rodriguez-Saona, Ph.D., Entomology
Nicholi Vorsa, Ph.D., Breeding, Genetics and Culture

Goals and Outcomes Achieved:
The project contained five objectives. Most importantly the disease cycle has been studied.

In phase 1 of the life cycle the pathogen is haploid and spreads from rust pustule to rust pustule (see objective 2). Fungicides targeting the rust will help prevent movement of the pathogen. Also, since we have found that the rust on briar (the primary species carrying

the fairy ring pathogen) is relatively rare, it will be practical for scouting services to target selective removal of infected plants. In phase 2 of the life cycle the fairy ring pathogen is dikaryotic and has entered the soil phase. This is very difficult and costly to control. However, application of fungicides to soil may be one approach to reducing disease impact (see objective 1 and 4).

Objective 1; Investigate fungicide efficacy for reducing ring expansion.

Objective 2; Determine how the pathogen spreads within and between cranberry beds. .

Objective 3; Develop a pathogenicity test and screen a cranberry germplasm for existence of resistance to this disease.

Objective 4; Investigate the possible existence of hypovirulent strains of the fungus.

Objective 5; Extension and outreach plan.

Presentation of the research results:

The fairy ring disease research results were presented at several meetings to growers in New Jersey, Massachusetts and Wisconsin.

Please see the attached documents below;

1. A handout for understanding fairy ring disease
2. A letter documenting our participation in a fairy ring workshop for growers in Massachusetts
3. Lectures provided to growers on Fairy ring

June 9, 2009 Fairy Ring Field Workshop, Cape Cod MA (approx. 12 growers)
August 20, 2009 ACGA Field Day Lab tour short discussion (approx. 45 growers)
Jan. 28, 2010 American Cranberry Growers Association Annual Meeting. (see attached, approx. 45 growers)
June 17, 2010 NJ Cranberry Twilight Meeting – Challenges in Fairy Ring Control (approx. 35 growers)
August 19, 2010 American Cranberry Growers Association Annual Meeting (see attached, approx. 45 growers)

Hard copies of the above attachments are on file with the Specialty Crop Block Grant Project Coordinator at the New Jersey Department of Agriculture. Electronic copies are included at the end of the report.

Beneficiaries

All cranberry growers in New Jersey and throughout the United States may potentially benefit from this research. The total value of the U.S. cranberry crop in 2010 was $321 million.

Each acre of cranberry beds which is saved from fairy ring disease saves a grower approximately $30,000 - $45,000 in replanting, management and lost production costs

New Jersey cranberry producers realized a total value of utilized production of $32.1 million in 2010, compared to $31.1 million in 2009. Cranberry price per barrel increased in 2010 to $57.20 per barrel, compared to $56.10 per barrel in 2009 and $53.00 per barrel in 2008. Growers produced on average 181.3 barrels per acre in 2010, up 2.3 barrels per acre from 2009. New Jersey ranked third in the nation in total production of cranberries. In 2010, New Jersey cranberry production totaled 562,000 barrels, up 1 percent from the 2009 crop of 555,000 barrels. Harvested cranberry acreage remained unchanged from the 2009 growing season at 3,100 acres.

Lessons Learned

Extensive testing of isolates from within a ring and between rings has confirmed that isolates collected from the same ring are of the same genotype while isolates collected from different rings are often distinct. We have found cases where neighboring rings are the same genotype and this is likely due to movement of sclerotia by machinery. Isolates collected from rings in different beds were always distinct genotypes. It is becoming increasingly clear that there are two distinct phases in this disease and control of the primary phase will help reduce disease spread and should be relatively easy whereas control of the soil phase (Phase 2) is much more costly and difficult.

Based on the discovery that formation of new rings is dependent on sexual reproduction it is likely that halting the sexual reproduction will be most effective in treating individual rings.

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Project Title;
New Jersey Wine Industry Marketing

Project Summary;
This project sought to re-design the "Passport Book" to the New Jersey Wine Country, create point of sale displays and to improve brand awareness for New Jersey wines.

The wine industry is one of few growing segments of New Jersey's agricultural economy. As new wineries emerge and the industry grows it is important to develop a consistent image for the industry.

Project Approach
Through the integration of additional information in the passport book combined with consistent point of sale advertising at the wineries supported by print and radio advertising the New Jersey Garden State Wine Growers Association seeks to increase sales.

New Jersey Wine Industry "Passport Book" Re-design
The "Passport Book" to the New Jersey Wine Country was re-designed and expanded to include valuable information previously found in the annual brochure put out by the Garden State Wine Growers Association. The new Passport Book became the cornerstone of all marketing for the very popular New Jersey Wine Trail Weekends. The Wine Trail Weekends were expanded to four events through the support of the new Passport Book that helped to foster a much greater understanding about each member of the Garden State Wine Growers Association. Consumer reaction to the expanded and redesigned Passport Book has been overwhelmingly positive with more than 25,000 copies distributed in the first printing.

"Point of Sale Displays"
First time "Point of Sale" displays were custom created for all members of the Garden State Wine Growers Association. These attractive pieces are now found in all tasting rooms of member wineries throughout the state. The display pieces allow for signage to be changed out as needed and provide an important avenue for communicating with customers. The "Point of Sale" pieces also hold the new Passport Books that puts them prominently displayed in all tasting rooms. Accompanying signage was also created for each winery member to further help promote the Passport Book program and the branding image of the New Jersey Wine Industry. Consumer reaction, and that of the GSWGA members, to the enhanced signage and displays has been extremely positive.

The passbook and the point of sale displays were designed and created by Kathy Bullock of GPS Incorporated under the supervision of the Garden State Winegrowers Association.

Billboards/Industry Branding/Awareness
The GSWGA effectively promoted the New Jersey Wine Industry through several major media avenues including print, radio and large advertising vehicles. As referenced in the

previous annual performance report the GSWGA modified their original plan to expend funds towards a major billboard campaign when it was determined that cost and available placement for the GSWGA message would not be effective nor would it be a positive use of funds. The GSWGA then determined, through further research and sampling of existing patrons, that expanding the marketing presence of the GSWGA on the internet, in long lead publications, extensive radio placement and the like would most effectively reach the demographic base of the GSWGA. Seeing the importance of this change the GSWGA utilized dollars raised by the organization to more than match those given from the grant. The original funds granted for the billboard campaign ($8,751) were allotted in the following means:

	FEDERAL FUNDS	**GSWGA FUNDS**
Internet Marketing	$3,000	$9,000
Publications	$1,000	$3,000
Radio Campaigns	$4,751	$50,000
Totals	$8,751	$62,000

The strategy of creating a "high awareness" campaign for the Passport Book program by way of extensive internet placement, publications and radio marketing proved to be overwhelming successful.

Data Collection/Report

The GSWGA created a simple survey form for each winery to collect information from each member winery following the four wine trail weekends. The information collected from the members assisted the GSWGA Marketing Committee in making decisions as to the effectiveness of their marketing campaigns. It also provided insight as to what marketing strategies were effective statewide and on a regional bases. It became apparent that the marketing and branding of the GSWGA, through the Passport Book and Wine Trail Weekends, had a positive effect on the increased sales of wine for our members.

Goals and Outcomes Achieved:

The "Passport Book" to the New Jersey Wine Country brochure was re-designed and expanded to include valuable information previously found in the annual brochure put out by the Garden State Wine Growers Association.

First time "Point of Sale" displays were custom created for all members of the Garden State Wine Growers Association.

Increased awareness of the NJ Wine Industry was marked by reports from member wineries that both attendance at wine trail weekends, including the successful addition of a fourth wine trail event, and general visitation throughout the year at tasting rooms across the state rose by an average of nearly 20% from previous years.

Successful marketing and branding coupled with a highly visible Passport Book

campaign & POS program were part of the keys to the success of increasing sales of NJ wines by our members of the GSWGA. Average sales increases of NJ wine during the time of this project were reported to be nearly 15% or better.

Beneficiaries

With 34 operating wineries New Jersey is the fifth largest wine producing state in the U.S. This project effected the members of the GSWGA in many positive ways. First was the increased awareness of the NJ Wine Industry through a vibrant marketing and branding campaign. Increased traffic/visitation to member wineries and their tasting rooms was reported across the board by our members. The success of the Passport Book redesign coupled with the attractive and consistent messaging of the POS pieces now found in all member winery tasting rooms translated to a two printings of the Passport Book (for a total of more than 30,000 pieces). In addition, this new awareness brought forth a fourth (and very successful) wine trail weekend added for Mother's Day. Taken together the overall report from the members of the GSWGA was that both visitations to wineries in NJ, along with sales of wine throughout the state increased by a very healthy margin.

Lessons Learned

Consumers appreciate receiving as much information as possible about the origins of their wines. Through a consistent marketing message and by tying wineries together into wine trails consumers get a better sense of the overall branding of New Jersey as a wine producing state.

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Project Title; Honey Bees and New Jersey, A Sweet Relationship

Project Summary;

This project was designed provide the electronic equipment needed to reach thousands of people, young and old, with basic audio/video programs containing information on the importance of beekeeping to New Jersey Agriculture as it serves the needs of our rural, urban and suburban communities.

This information was then presented to specific subgroups emphasizing the importance of the honeybee to the production of our food, as well as maintaining a diverse and healthy natural environment.

With the recent decline in bee population in New Jersey and across the country it is important and timely to promote an increase of beekeepers among the general public and that public officials, policemen and firemen have the critical information to respond to migratory swarms and accidental hive releases during transport.

Project approach;

The project was divided into three distinct phases:

a) Identification of the best technical tools available to compete with the sophisticated audio/video equipment in use in corporate advertising presentations using the criteria of viewer appeal, ease of use, durability in transport and cost control

b) The development of power point presentations to deliver our message with and without audio components for each specific subgroup of the population targeted.

C) Reaching out to targeted conferences, fairs and student events by manning display tables with New Jersey beekeepers to answer question evoked by the audio/visual presentations.

During this project the number of beekeepers in New Jersey has doubled providing a stronger base of pollinator resources. New Jersey beekeepers provided the expertise necessary to make this project successful by guiding the review of technical equipment available to meet these needs, controlling purchasing costs, designing and developing multiple programs for touch screen and computer projected equipment and staffing presentations at:

Goals and Outcomes Achieved

The NJBA efforts have had an effect on the market acceptance of “local” honey and hive products. The information is fragmentary but positive.

1) Despite a high unemployment rate, verbal reports indicate that the sale of "local honey and hive products has generally exceeded last year’s demand.

2) "Local honey" has been selling well at between $6.50- $8.50 per pound.

Differentiating "local honey" from "commercial honey" has helped to create an increased value the NJ beekeeper.

GOAL I: identification of the best technical tools available to compete with the sophisticated audio/video equipment in use in corporate advertising presentations emphasizing viewer appeal, ease of use, durability in transport and cost control

ACHIEVEMENTS

Two sets of audio visual equipment and display components were purchased providing a set of equipment for use in South Jersey and simultaneous ability for events occurring in the northern sections of the state. These include:

1) 4 self-contained computer equipped with touch screens (DOTS) were purchased as the mechanism to reach individual young and older attendees at small venue presentations like schools and libraries etc.

This equipment, packaged in tough portable cases, permits ease of movement and self-serve mechanism to impart knowledge on basic biology on the honeybee.

2) 2 laptop and 2 projectors for larger presentations such as conferences.

3) 2 audio amplifiers with speakers and microphones

GOAL 2: development of power point presentations with and without audio components for each specific subgroup of the population targeted.

ACHIEVEMENTS

Two presentations were developed for use in the touch screen DOTS.

A) The first DOT1 is a split screen presentation with questions on the left side and simple video presentation on the right each of which are activated by a touch of the finger.

B) Unique power point presentation was developed for the following target audiences:

FARMERS—Slides delineate the importance of honeybee pollination to crop production, pollination value, pesticide safety and contact information.

HEALTH OFFICIALS- Slides delineate wasp/honeybee behavior, stinging behavior, population sensitivity to vespid toxins, crop production, honeybee best management practices, and policies of selected municipalities and importance in food production

LEAGUE OF MUNICIPALITIES- Slides delineate non aggressive behavior of honeybees, yellow jacket identification, probability of being stung by a yellow jacket, importance of pollination to food production, contact information, best management practices and current public policy in urban areas.

GOAL 3- C) reaching out to targeted conferences, fairs and student events by manning display tables with New Jersey beekeepers to answer question evoked by the audio/visual presentations

Beneficiaries

The presentation at the N.J. Agricultural Convention enhanced the interaction between farmers and beekeepers using the exchange of information and a discussion of mutual problems. This convention also provided an opportunity to discuss policies governing the maintenance of rights of way running through farm and public lands with the objective of maintaining pollinator habitat and populations.

The presentation to N.J. Public Health Officials at their convention allowed focus on the nature of honeybee behavior and contrast with that of carnivorous yellow jackets. A frank presentation covering vespid toxins and the fact that yellow jackets are responsible for the vast majority reported stingings was followed by a presentation of the importance of honeybee pollination to both the human food supply and maintenance of natural plant diversity. The importance of these discussions cannot be over emphasized because the Health Sanitarian is a first responded to urban entamaphobes and must be well informed that honeybee benefits far eclipse the risks in the urban and suburban communities that dominate the New Jersey landscape. The evolution of nurturing public policy on honeybees is imperative to New Jersey. The presentation to the NJ League of municipalities will provide the next step toward this goal.

There is no substitute for an informed citizenry. The fairs and other presentations provided opportunities to get sound information to the young and old of our state. The best way to overcome fear of the honeybee is counteract it via sound basic information and experience.

Finally the beekeeping community has become a beneficiary of our own outreach efforts via this grant. Transforming beekeepers into confident presenters of this information creates a team to continue providing factual information that leads to sound public policy and a healthy farming and natural environment.

I estimate that highly tailored presentations were made by the New Jersey Beepkeepers Association (NJBA) under the crop grant at events attended by 400,000-500,000 new jersey citizens. Some of the presentations were directed to NJ municipal officials while others focused on the general public. All of the presentations had the same goal " Development and maintenance of support for beekeeping and beekeepers with the differentiation of "local NJ hive products" from commercial products from outside of NJ or America.

The success of the NJBA effort will be judged in the future. However, there is some information that indicates the impact of those educational activities.

1) NJ Health Official have agreed to training efforts to inform local personnel of the behavior, benefits and risks associated with the Honey bee , Apis mellifera, when maintained in accordance with "NJ best management guidelines". This is a major break through since urbanization is the biggest single threat to NJ beekeepers.

2) The impact of our presentation to the mayors and officials of NJ 500+ municipalities is yet unknown. However, several NJ municipalities are becoming active supporters of beekeeping for the back yard gardner and natural environment

3) The importance of honey bee pollination to the yields of orchard, berry, and vine crops was reinforced via presentations the NJ Agricultural convention. The mutual benefit of developing a beekeeping community capable of accommodating NJ pollination needs and increasing farm yields was our goal. A few NJ beekeepers have moved toward becoming small scale pollinators. The challenge remains for us to maximize the beekeeper/farmer benefits while avoiding the pesticide risks to pollinator health.

ESTIMATED NUMBER OF ATTENDEES AT EVENTS

N.J. State Agricultural conference	500
N.J. State Environmental Health Conference	500
N.J State League of Municipalities (scheduled for Nov)	16,000
N.J. Beekeepers meeting; Bordentown, N.J. (fall 2010)	220
N.J. Beekeepers meeting; Cape May, N.J. (spring 2011)	250
N.J. Beekeepers meeting; Liberty, N. J. (fall 2011)	230
Monmouth County State Fair 2011	100,000
Cape May State Fair 2011	100,000
Sussex County State Fair 2011	200,000
Farm Bureau meetings Trenton, N.J. 2010, 2011	8,000
Earth Day presentation Central Jersey 2011	500
Somerset County 4H Fair	10,000

Lessons Learned;

Nothing goes completely as planned and it is most important to keep our eyes on the goal as new knowledge forces change upon the project. It is most difficult to see all of the problems at the beginning of a project.

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Project Title;
Tri-County Cooperative Development

Project Summary;
This project created a 29' x 37' refrigerated storage room.

Without adequate refrigeration in compliance with current food safety standards, it is impossible to store product for daytime pick-up and ultimately, delivery. The "Buy Local" movement is a strong incentive for restaurants and institutions to patronize the Coop, but the night auctions do not accommodate their schedules. The timing of the auction cannot be changed at this time since it meets the needs of the farmers that harvest during the day as well as often run their own farm markets. Having sanitary refrigeration will permit the placement of orders that can be filled when farmers bring their produce to the auction, properly refrigerated, and picked up when convenient for the end users. The Coop is also implementing a "Community Shares Agriculture" project for the general public. This will allow individuals, or families, to purchase a share and pick up their shares, which will be pre-sorted, on a specific day and time. Refrigeration will greatly enhance this program and allow for much greater flexibility for preparation of the shares and pick-up for the shareholders.

Project Approach
The 29' x 37' refrigerated storage room was created with access to accommodate a fork lift, insulated walls and condensers making the cooler room fully operational.

Pegi Ballister Howells is the cooperative auction's manager and she supervised all of the contractors and oversaw the completion of the project.

Goals and Outcomes Achieved:
The goal of this project was fully achieved with the installation and operation of the refrigerated.

The cooler room was fully operational when the cooperative opened for the full season in Mid-June.

All potential customers were informed by hard copy mail of the upcoming installation of the cooler prior to the Annual Meeting held in March. Information was also distributed at the Vegetable Growers meeting held in Atlantic City in January. Two articles were written about all the changes at the Coop, including the advantages of the cooler in the spring. One in the NJ Farmer and another in The American Vegetable Growers magazine. The manager, Pegi Ballister-Howells, has a call in radio show on Sunday mornings and the use of the cooler and all upcoming crops were discussed as a routine part of the of the show. The cooler project was also mentioned at different times on the website.

For the 2008 growing season The Tri-County Cooperative Auction Market Association received $625,960.00 in direct sales.

In 2010, the year the cooler was installed the cooperatives direct sales were $916,760. Total of both direct and auction sales for 2010 were $1,066,000.

In 2010 the cooperative's customer base went from approximately 450 to 600.

Additionally the Cooperative is working to expand into the Community Supported Agriculture (CSA) marketplace. Through CSA's, for a fixed price, consumers commit to picking up a weekly, or monthly, supply of the currently available locally produced fresh fruits and vegetables. This is an important and growing market, which helps to more directly relate to the seasonal production of locally produced fruits and vegetable. Through CSA's consumers essentially become shareholders in the farms which are locally producing agricultural products.

In 2010 we added approximately 25 to 30 new CSA members from the city of Newark which was a special grant funded project through the city. We also opened up the pickup schedule for our regular CSA member since the product was now refrigerated and did not need immediate pickup.

Although the coop lost its largest supplier this year, (the grower that left supplied approximately 30% of the product sold in 2009) the coop exceeded last year's total sales. The increase was from $1,014,000 to $1,061,000. This was due largely to being able to accumulate large orders in the cooler using different growers. The cooler was critical to having this capability. Then the larger orders were delivered by one of the farmers to two large food bank institutions. A third Food Bank was able to call in orders to insure adequate quantities of needed items. By doing so, we were able to significantly increase the volume of items purchased as farmers were contacted to insure bringing the quantities requested. All was accumulated in the cooler for the Food Bank to pick up on Tuesday mornings. Throughout the year the number of buyers that called in orders, either directly through the manager of the coop or through grower members increased. This allowed buyers to make purchases even when they were not able to come to the coop during the night hours as they would pick up the following day. The final benefit of the cooler was for the coop to have product available from growers that did not participate in the coop in the past and were not able to actually be there during the night hours of operation. An excellent peach grower was able to deliver peaches during the day to be stored in the cooler. Broccoli, cauliflower and cabbage were too large to put in boxes and were sold by the piece. Bins of these crops were stored in the cooler for sale at night, but also to restaurants and some farm marketers that sold out so fast, they came back the next day for more. An excellent blueberry grower was added to the coop in 2009, but product availability was limited to what could be sold in one night. With the cooler, larger quantities moved through the market and buyers that never came for other reasons, would come during the day for blueberries. Without question the cooler has been an enormous boon to the coop, opening tremendous opportunities and allowing continued growth even in a year with some major obstacles.

We have not reached a 20% increase in sales as of yet, but expect to exceed that in 2011. The drought of 2010 combined with the loss of the coops largest supplier created major supply challenges. Yet the coop has continued to show growth. The cooler is the only major change in the capabilities of the coop and so is primarily responsible for the coops growth in spite of the obstacles. CSA participation also increased, and by storing CSA baskets in the cooler, the quality of what the participants received retained its freshness and got rave reviews. The previous year required early morning pickup, in the absence of refrigeration, to retain freshness and that was not always possible for all the members. We are anticipating a jump in CSA participation as a result. CSA income is kept separate from farm sales income.

Beneficiaries

In addition, an enormous benefit to having the cooler is our sales to NJ food banks. This is especially true for the large food bank in Hillside, NJ. With the benefit of the cooler, the buyer now calls in orders weekly of 4-6 items in volume of 50 to 100 cases each. These large volume items are delivered to the coop from our grower members and stored in the cooler until the food bank truck arrives for pickup. The buyer continues to shop in person to purchase off the dock, but without the cooler these large volumes would not be possible. This single buyer increased sales from

2008 Food bank Donations were: $ 3,074.00

2010 Food bank Donations were; $ 65,939.94

2011 (Partial Year) Food bank Donations; $476,711.00

In the past few years the Tri-County Cooperative Auction Market Association has seen something of a renaissance as it renewed its focus to supply the growing demand from buyers for roadside and community farmers markets. The recent increase in sales to growers or vendors seeking locally produced product to complement their locally products for sale at roadside markets and community markets has been in line as that sector of the agricultural marketing sector continues to grow.

The potential impact of having refrigeration will affect all 57 farmer members by creating new markets for their products. Daytime availability opens many avenues for potential clients that simply do not exist when product is only available in the evening. More customers will mean better prices for the existing products, so even growers that do not sell to new clients will benefit from greater demand. The cooperative will benefit as their commission on sales will be greater and this money will go into further renovations and promotions, which in turn will further benefit farmer members. The new clients will benefit as they will have access to fresh locally grown produce that is convenient to their schedules, so their consumption of local produce will increase.

Lessons Learned
Access to refrigerated storage helped the cooperative increase its sales, its CSA participation and also the value and quantity of foods donated to area food banks.

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Project Title;
Agricultural Leadership Development Program

Project Summary;
The New Jersey Agricultural Leadership Program works with specialty crop growers to develop skills in a variety of areas including business communications, marketing, decision- making, negotiating, and business and personal leadership. The skills which participants acquire can be used to improve their own specialty crop business and enhance their involvement in the agricultural organizations that work to promote and secure markets for the specialty crop industries in New Jersey.

Recent consolidations in the wholesale and retail channels of distribution for specialty crops continue to make it more difficult for small producers of specialty crops to gain and maintain access to those traditional markets. Now, more than ever, it is increasingly important for growers to identify and develop new skills to meet the challenges of the evolving marketplace.

In the 21st Century world of instant communication it is more important than ever to have effective industry spokespeople prepared to respond to routine press inquiries but also more importantly to be local industry representatives in the event of a food safety crisis. When distant growing regions are identified as the source of a food safety issue providing a timely and informed response to the media and to consumers can make the difference between suffering collateral damage and creating a market opportunity.

Project Approach

The New Jersey Agricultural Leadership Development Program is a two-year professional development opportunity, which is designed specifically for individuals in farming and agribusiness. Through a series of seminars and interactive workshops, NJALDP participants explore various agricultural topics and work to cultivate an extensive network of young specialty crop growers trained in business skills and agricultural communications throughout the State.

Although it is difficult to quantify the return on investment for business education and communication training, specialty crop producers who can effectively communicate the benefits and concerns of their industry both within the agricultural community and to the outside media can be a very valuable economic asset. At no time has the need for effective spokespersons been more evident than during food safety crisis's such as the 2006 E. coli outbreak on spinach products or during this year's food borne illness scare initially attributed to tomatoes. In a midst of a food safety crisis the ability to effectively communicate the food safety attributes of New Jersey specialty crops in a timely and effective manner can ensure continued access to the marketplace and also reassure consumers. The ability to continue to market the two aforementioned specialty crops during that crisis's salvaged about $30 million of New Jersey specialty crop production during those two difficult marketing years.

Each year twenty young members of the agricultural community are accepted into the comprehensive New Jersey New Jersey Agricultural Leadership Program organized by the non-profit New Jersey Agricultural Society. With support from SCBG funds the NJALDP will be able to expand its education and training programs to include special one day programs to provide continuing education to previous program graduates and to other specialty crop producers unable to make the necessary commitment for the full time NJALDP.

Activities Performed

Food Safety Seminar

Purpose of the Seminar; Specialty Crop Food Safety Training
Attendance; 24

The NJALDP conducted a seminar on food safety with the leaders in the academic and industry sector. Presentations on food safety were made by Kelly Johnson - Campbell Soup Company, Brian Schillings – Rutgers, Biosecurity, Wes Kline – Rutgers, On-Farm Food Safety Audits and Paul Kneeland - Kings Supermarkets. The seminar focused on food safety for specialty crop commodities.

Field Study of Trends in Marketing and Distribution

Purpose of the Seminar; Tour of Specialty Crop Food Processing Plant
Attendance; 25

The NJALDP visited Seabrook and Sons - an operation that freezes fresh vegetables, ARC Greenhouses – an operation that grows fresh greens and herbs, and Sheppards Farm, a large vegetable farm. The objectives of these tours were to discus various marketing strategies for specialty crops and examine different business models for the production, adding value and distribution of specialty crops.

Tour of Port Newark

Purpose of the Seminar; Specialty Crop Food Safety Training
Attendance; 30

Class Seven organized a behind the scenes of the agricultural inspection operations at Port of Newark Marine and Air Terminals. Together with alumni from Classes III, VI and VII, Class 8 witnessed firsthand the complex agriculture security network in place that truly sits on the frontlines of the battle to ensure U.S. food security. This visit provided enormous education and invaluable insight into the importance of safeguarding our nation's food supply and natural resources.

As most major supermarkets chains are now requiring some level of food safety certifications from all of their suppliers food safety is increasingly a major consideration in the marketing and distribution of fruits and vegetables. Specialty crop producers unwilling, or economically unable, to meet the continually evolving food safety standards are at risk of losing access to most chains of distribution and major retail markets.

Providing education on the importance of food safety, and training in the methodology of the agricultural inspection process, helps specialty crop producers to continue to be competitive in the retail sector which sells the majority of specialty crops produced in New Jersey.

Business Skills, Leadership Development and Communication
Purpose of the Seminar; Business Skill Training for Specialty Crop Producers
Attendance; 26

The NJALDP has also conducted three seminars to develop business skills, leadership qualities and effective communication for young leaders in the specialty crop industry. These seminars have featured such speakers as Robert Goodman, the Dean of Rutgers University; Douglas Fisher, the New Jersey Secretary of Agriculture and Rich Nieuwenhuis, the President, New Jersey farm Bureau.

Significant contributors to the project;
Mary Nikola, Ed.D. was the program coordinator. Ms. Nikola developed the program content and oversaw all of the planning and implementation of the program including such tasks as coordinating the meeting locations and scheduling the speakers.

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Joan Elliot with the New Jersey Agricultural Society provided an advisory role to the program coordinator. Since the Agricultural Leadership Development Program is a program provided by the New Jersey Agricultural Society Ms. Elliot provided administrative support and oversight to the Agricultural Leadership Development Program.

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Goals and Outcomes Achieved:
Through the expansion of the NJALDP no less than nineteen additional specialty crop growers received additional business development and agricultural communications training through the use of SCBG funds. Combined with the regular program participants a total of 39 specialty crop growers received additional business training through this SCBG project.

Program participants identified that the NJALDP helped to improve their public speaking skills and improved their ability to run meetings with improved agenda; time management and teamwork. They identified that the program improved their advertising, networking and communication skills.

Over 80% of previous graduates from the NJALDP have documented that their participation in the program has improved their careers in agriculture. The SCBG grants provided access to NJALDP training that otherwise would not be available to growers.

Beneficiaries
Program graduates regularly assume leadership positions within the New Jersey agricultural and specialty crop community. They have an impressive track record of participation on the State Agricultural Development Council, state wide commodity organizations, on their county boards, on the State Board of Agriculture and in once instance as a Warren County Freeholder.

A total of 39 specialty crop producers were the beneficiaries of this project. It is intrinsically difficult to quantify the benefits of education. But many of the program participants have contributed their expanded involvement within the agricultural community to what they learned in the NJALDP. Some of the agricultural organizations that the NJALDP participants have become involved in as a result of their participation are; their County Boards of Agriculture, the Rutgers Board of Management, the New Jersey Direct Marketing Association, the New Jersey Agricultural Society, and the County Future Farmers of America Advisory Committee.

Lessons Learned
Participants in the NJALDP were able to learn better management and business skills and gained confidence in managing groups of people.

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2009 Annual Summer Meeting of the American Cranberry Growers Association

P.E. Marucci Center For Blueberry & Cranberry Research & Extension
Rutgers University, Chatsworth, NJ
Thursday August 20th, 2009

Presentation Summaries

American Cranberry Growers Association
2009 Summer Field Day
Thursday August 20, 2009
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 19)

830 Opening Remarks
Stephen V. Lee, IV President, American Cranberry Growers Association

8:30–9:00 2009 Trials with New Insecticides (Bogs 19-20)
Dr. Cesar Rodriguez-Saona, Extension Specialist, Rutgers University

9:00–9:30 Use of New Fungicide Combinations for Fruit Rot Control (Bog 11)
Dr. Peter Oudemans, Extension Specialist, Rutgers University

9:30–10:00 Update on Chemical Control of Flowering to Enhance Bed Establishment and Reduce Fungal Inoculum (Bog 6)
Dr. James Polashock, Research Plant Pathologist, USDA-ARS, *Dr. Peter Oudemans*, Extension Specialist, Rutgers University

10:00-10:30 Cranberry Breeding Update: Breeding for Fruit Rot Resistance and Maintaining Cultivar Purity (Bog 4)
Dr. Jennifer Johnson-Cicalese, Research Associate, *Dr. Nicholi Vorsa*, Extension Specialist, Rutgers University

CONFERENCE ROOM:

10:50-11:20 Honeybees, wild bees, and the mechanics of cranberry pollination
Dr. Daniel Cariveau, Post-doctoral Research Assistant, Department of Entomology, Rutgers University

11:30–12:00 Pesticide Applicator Safety
Mr. Ray Samulis, Cooperative Extension Agent, Burlington County Extension, Rutgers University

12:00–12:10 Teaching Students Pineland Agriculture and Preparing for the Cranberry Harvest Tour

Ms. Barbara Rheault, Teacher, Mullica Middle School, Elwood NJ

12:10–1:30 LUNCH (POLE BARN)

1:30–2:30 LAB TOURS

Dr. Nicholi Vorsa. Nick is Director at the Marucci Blueberry and Cranberry Research and Extension Center. His research interests involve the areas of plant breeding, genetics, germplasm evaluation and reproductive plant biology.

Dr. Amy Howell. Amy is an Associate Research Scientist at the Marucci Blueberry and Cranberry Research and Extension Center. She works on isolating natural products from cranberries and blueberries that benefit health.

Dr. Peter Oudemans. Peter is an Associate Professor in the Department of Plant Biology and Pathology at Rutgers University and is stationed at the Marucci Blueberry and Cranberry Research and Extension Center. Peter's research program tackles problems in the biology and control of fungal diseases of blueberry and cranberry.

Dr. Cesar Rodriguez-Saona. Cesar is an Assistant Professor in the Department of Entomology at Rutgers University and is stationed at the Marucci Blueberry and Cranberry Research and Extension Center. His research program focuses on the development and implementation of cost-effective reduced-risk insect pest management practices for blueberries and cranberries.

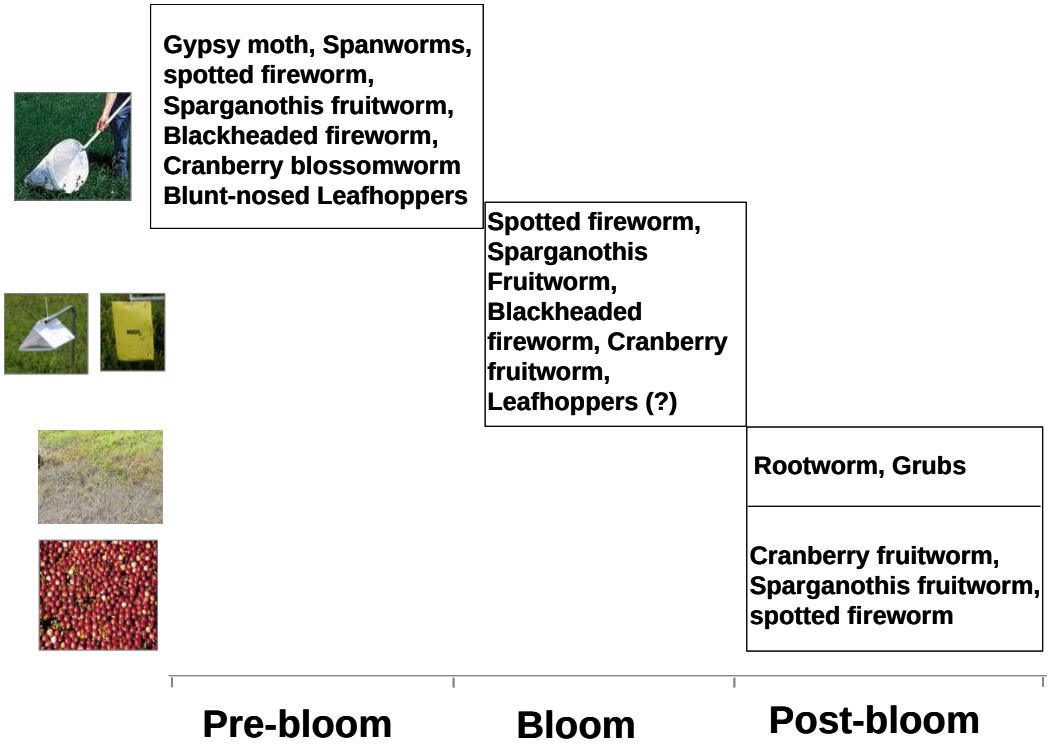
TRIALS WITH NEW INSECTICIDES

Cesar Rodriguez-Saona, Robert Holdcraft, and Vera Kyryczenko-Roth
P.E. Marucci Center for Blueberry & Cranberry Research & Extension,
Rutgers University, Chatsworth, NJ

INTRODUCTION

Not all insects are pests in cranberries. Knowing how to recognize and monitor these pests are key components in insect pest management.

<u>Monitoring for Cranberry Insect Pests</u>



In New Jersey, cranberries have historically been attacked by *Sparganothis* fruitworm, spotted fireworm, blackheaded fireworm, and recently by gypsy moth. Changes in pest management practices due to reduction of organophosphate and carbamate use may cause an increase in secondary pest populations. A major concern among New Jersey growers is the blunt-nosed leafhopper that transmits false blossom. Below is a brief overview of these insects:

***Sparganothis* fruitworm**- Larvae will feed on the fruit surface, inside berries, and on foliage. One larva may feed on several berries. This insect has 2 generations a year.

Adult flight usually peaks towards the last week in June. A second adult flight starts in mid-August and continues through September, these adults will lay eggs, and the newly hatched first instars will overwinter.

Spotted fireworm – High numbers of spotted fireworm larvae are often seen only in cranberry beds where weeds are present in high density. Thus, growers need to monitor for the presence of egg masses on weeds (broadleaf species and grasses). Adult flight typically peaks in the second through third week in June. Larvae from this generation feed on foliage as well as fruit. A second adult flight starts in early August, eggs from the second generation begin to hatch by mid-August, and these larvae will feed on berries and overwinter as second instars. This insect has 2 generations a year.

Blackheaded fireworm – This insect is a sporadic pest in New Jersey. It overwinters on cranberry leaves as eggs. The first-generation larvae are foliar feeders, while the second-generation larvae feed on blossoms and fruit. Growers need to be careful when monitoring for this particular pest during the first generation because, if left untreated, the second generation can cause serious damage. First-generation larvae feed on terminal foliage, webbing them together. Feeding can cause vines to appear as if burned. This insect can be detected by looking for webbing in the upright tips.

Blunt-nosed Leafhopper – This insect is the principal vector of a phytoplasma that causes cranberry false blossom, which threatened the entire cranberry industry in the early 1900's. This leafhopper does not move around much, and colonization of bogs occurs slowly. The insect completes one generation a year and overwinters as an egg. Eggs begin to hatch in early May. The nymphs go through five instars in about a month. The adults begin to appear early in July and are most abundant in mid-July. Numbers of this species start to diminish by the first week in August. The adults have a characteristic blunt head and vary from light yellowish-gray to dark brown.

CURRENT STATUS

A few new insecticides have been recently registered for control of insect pests in cranberries. These include: Avaunt, Delegate, and Assail. These have been added to the list of reduced-risk insecticides and organophosphate replacements in cranberries; which consisted of Bt products, the insect growth regulators Confirm and Intrepid, and the neonicotinoid Actara, among others.

Avaunt (Indoxacarb). Avaunt belongs to a new class of insecticides called the oxidiazines. This insecticide has a novel mode of action: it works by inhibiting sodium ion entry into the nerve cells that results in paralysis and death of the targeted pest. Avaunt has broad-spectrum activity and is designated by the EPA as a "reduced-risk" pesticide. This insecticide is effective against some lepidopteran pests in cranberries, including blackheaded fireworm, gypsy moth, and blossom worm, but has low toxicity against *Sparganothis* fruitworm.

Delegate (Spinetoram). This insecticide is similar to SpinTor in that they are both derived from fermentation of a species of bacteria; however, they have different active ingredients. Delegate has both contact and stomach activity, and is highly effective against many lepidopteran larvae: gypsy moth, armyworms, fireworms, *Sparganothis* fruitworm, and spanworms.

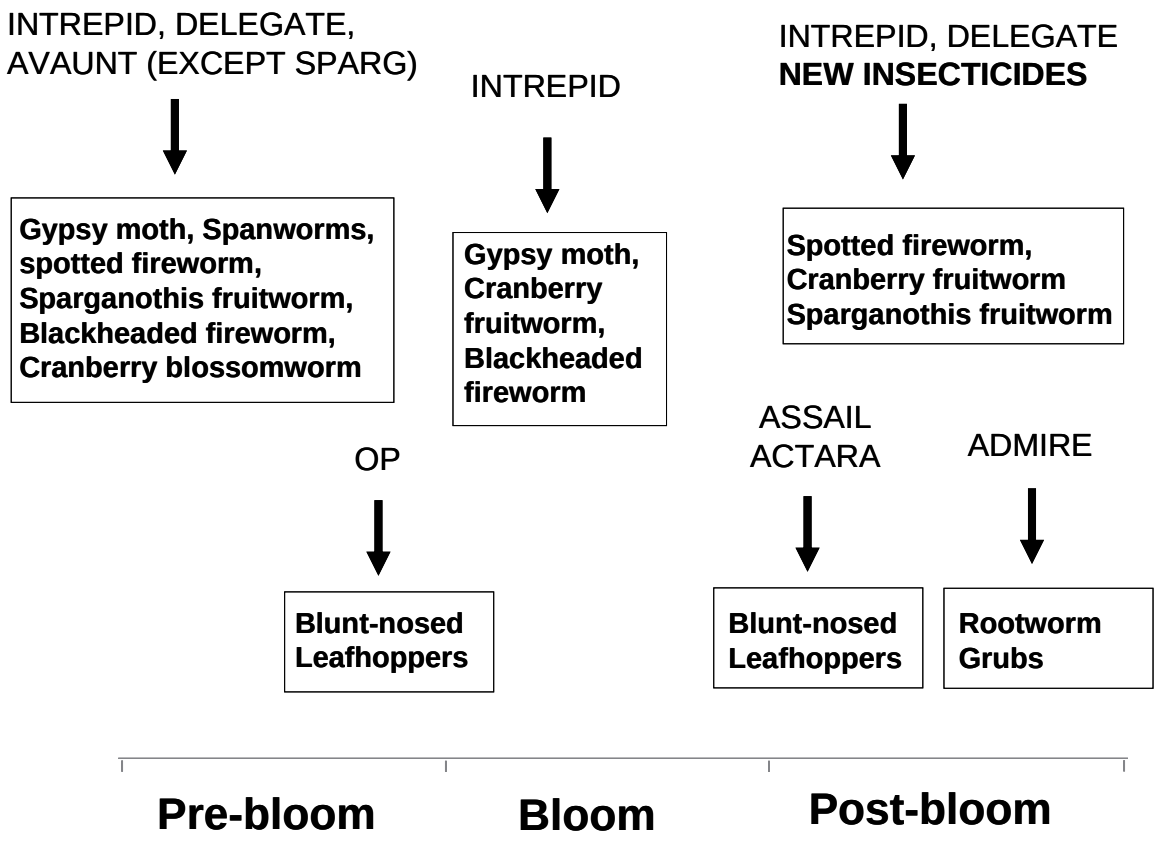
Assail (Acetamiprid). This is a new neonicotinoid insecticide with broad-spectrum activity. It is effective against leafhoppers and certain lepidopteran pests (gypsy moth and cranberry fruitworm).

Efficacy of Newly-Registered Insecticides against Major Cranberry Pests in New Jersey

Target Pest	New Insecticides: Efficacy Rating[1]				
	Intrepid[2]	Delegate[3]	Avaunt[3]	Assail[3,4]	Actara[3,4]
Cranberry Fruitworm	++++	++++	++	++++	—
Sparganothis Fruitworm	++++	++++	+	++	—
Cranberry Blossom worm	++++	++++	+++	—	—
Blackheaded Fireworm	++++	++++	++++	—	—
Spotted Fireworm	++++	++++	++	++	—
Gypsy Moth	++++	++++	++++	++++	—
Bluntnosed Leafhopper	—	—	—	++++	++++

[1] ++++ = excellent, +++ = good, ++ = fair, + = poor, — = not tested or not recommended
[2] Can be used during bloom
[3] Do not use during bloom
[4] Not recommended before bloom

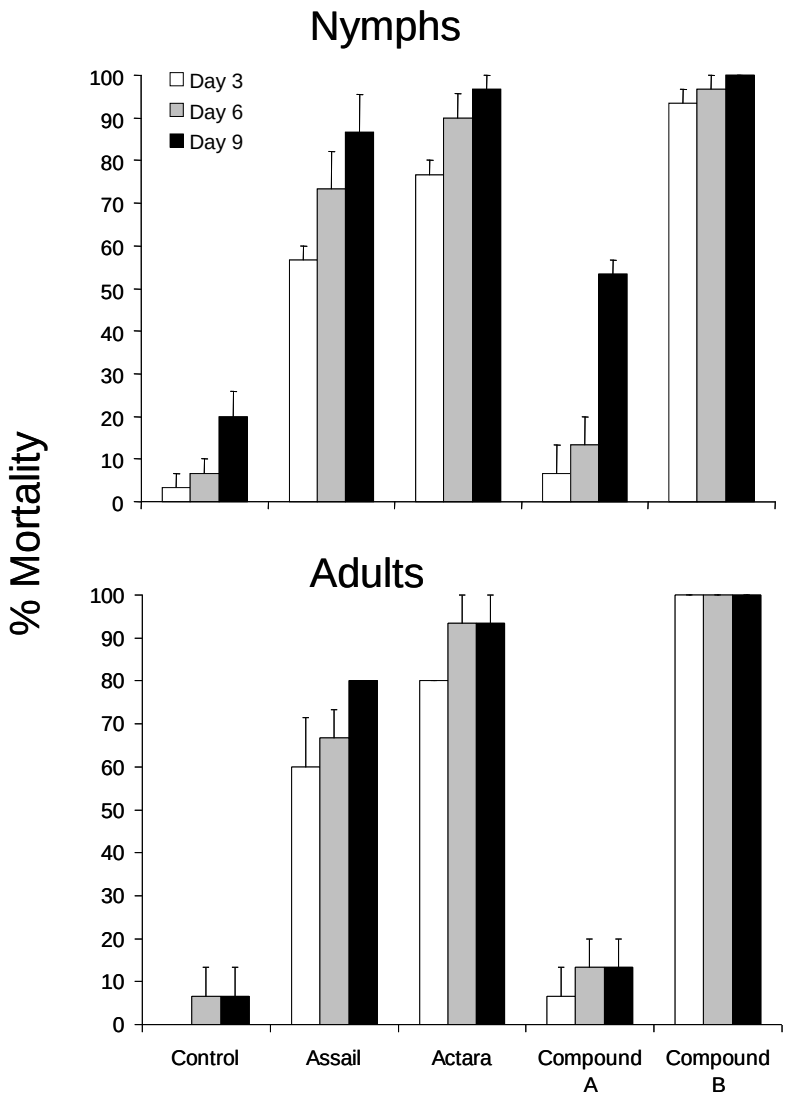
Timing of Control Options



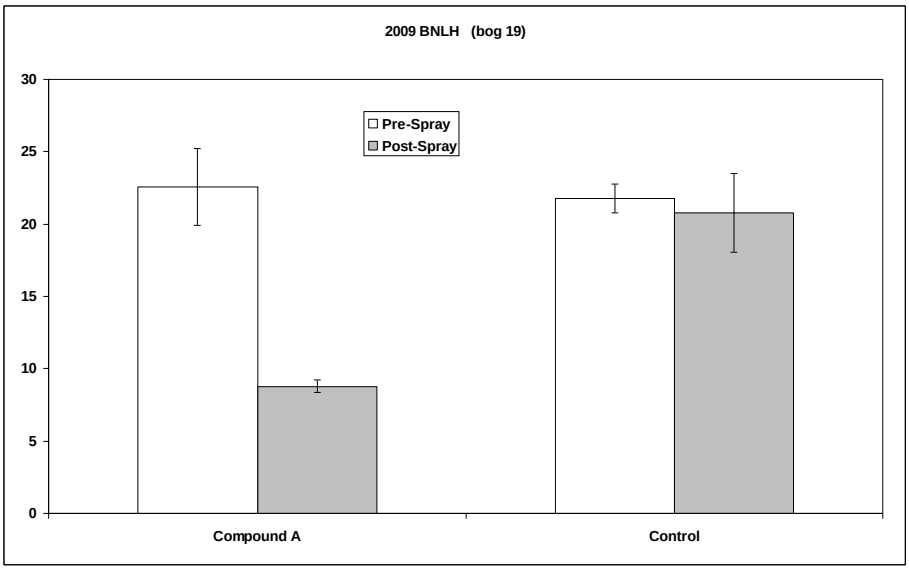
CURRENT RESEARCH

In 2009, the entomology program conducted trials to test newly-registered and unregistered insecticides against leafhoppers and *Sparganothis* fruitworm.

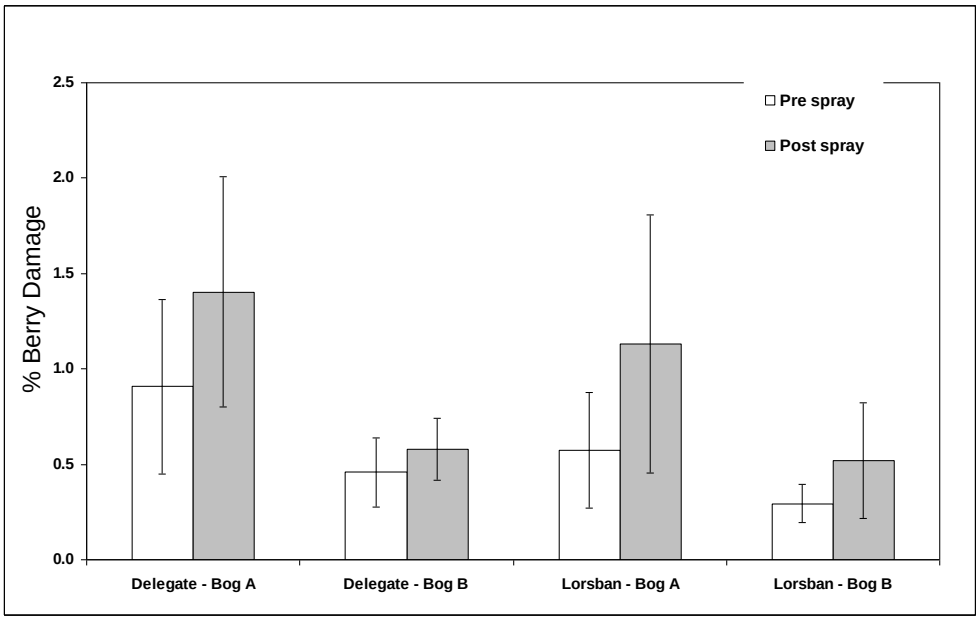
Laboratory trial for blunt-nosed leafhopper control: Base-level toxicity of Assail (4 oz/acre), Actara (3 oz/acre), Compound A, and Compound B were evaluated against leafhopper nymphs and adults in the laboratory on cranberry treated foliage and compared to untreated foliage. Insecticide treated and untreated uprights were inserted in florists' water picks, enclosed in a ventilated 40-dram plastic vial, and secured in Styrofoam trays. Mortality was assessed 3, 6, and 9 days after transfer. Assail, Actara, and Compound B provided good control against nymphs and adults. Compound A provided only 50% control of nymphs after 9 days.



Field trial for blunt-nosed leafhopper control: We evaluated the efficacy of a pre-bloom application of Compound A against blunt-nosed leafhopper nymphs. A cranberry bog located at the Rutgers Blueberry/Cranberry Center was divided into 6 plots. Half of the plots received one treatment (Compound A), while the other half were untreated controls. Application was made on 6 June. Sweepnet samples were taken from each plot on 4 June (pre-treatment) and 29 July (post-treatment). Compound A provided 57% control against blunt-nosed leafhopper after insecticide application.



Field trial for Sparganothis *fruitworm control:* This trial evaluated the efficacy of a post-bloom application of Delegate and Lorsban against *Sparganothis* fruitworm. The test was conducted in 4 commercial cranberry bogs. Two bogs were treated with Delegate and two bogs with Lorsban. Both insecticides provided similar control.



Cranberry Fruit Rot Control

Plant Pathology Lab
Peter Oudemans, Chris Constantelos, Donna Larsen, Jennifer Vaiciunas

Cranberry fruit rot is currently one of the most destructive cranberry diseases particularly in warmer growing regions such as New Jersey and Massachusetts. Historically, it has also been one the most economically important factors affecting cranberry production (Shear et al.,1931). The disease is actually caused by a wide variety of fruit infecting fungi. Shear (1907) and Shear et al. (1931) identified over 15 species of fruit infecting ascomycetes (anamorph and/or teleomorph) of both major and minor importance. Subsequently, mycologists described several new species (Weideman and Boone, 1982, Carris, 1990) and there are currently eleven species considered to be economically important (Table 1).

Cranberry fruit rot can be divided into two general classes (Wilcox, 1940). Field rot typically expresses prior to harvest and storage rot is a post harvest disease important for fresh marketed fruit. There is significant overlap among the species causing field and storage rot and typically one species cannot be classed as exclusively causing either field rot or storage rot. On exception is the end rot pathogen *Godronia cassandrae* (*Fusicoccum putrefaciens*) which is primarily a postharvest problem. The causal agent can be determined by culturing rotted fruit on common microbiological media. In many cases more than one fungal species is isolated from a single fruit. Cranberry fruit rot is widespread and occurs at differing levels depending on climatic conditions. It is more of a problem in the Northeast (NJ and MA) than it is in the Northwest (OR, WA, BC). In Wisconsin and Quebec the disease occurs at very low levels and most growers utilize a minimal spray program. Organic production can only occur in areas where fruit rot pressure is low.

Each fruit rotting species has a unique life cycle and mechanism of spread (Oudemans et al. 1998). Composition of the fruit rot community in a single cranberry bed may vary significantly from one year to the next when only rotted fruit are tested. One reason for this may be that the fungi (Table 1) reproduce successfully without infecting fruit and thereby maintain an active population that will cause fruit rot only when the conditions are conducive for that species. McManus et al (2003) compared different growing conditions and harvesting techniques and found that the compliment of fungi isolated from rotted fruit statistically similar. There has been significant research examining overwintering sites for each species and use of molecular diagnostic methods may become very useful in accurately characterizing the fungal fruit rot community in individual cranberry beds (Robideau et al. 2008)

Table 1. Important cranberry fruit rot pathogens				
Latin Name of Fungus	Common name	Type	Abound Flowable	Indar 2F
Allantophomopsis cytosporea	Black Rot	Storage[1]	?	?
Allantophomopsis lycopodena	Black Rot	Storage[1]	?	?
Phyllosticta elongata	Berry Speckle	Field[1]	?	?
Phyllosticta vaccinii	Early Rot	Field[1]	+	+
Colletotrichum gloeosporioides	Bitter rot	Field[1]	+	+
Colletotrichum acutatum	Bitter rot	Field[1]	+	-
Physalospora vaccinii	Blotch Rot	Field[1]	+	+
Coleophoma empetri	Ripe Rot	Field[1]	-	+
Phomopsis vaccinii	Viscid Rot	Field[1]	?	?
Strasseria geniculata	BlackRot	Storage[1]	?	?
Fusicoccum putrefaciens	End Rot	Storage	?	?
[1]Found in both storage and field rot stages but predominates in one				

From a practical perspective fruit rot is normally treated as a single disease. Management strategies including choice of fungicide and timing of application target fruit rot without regard for individual species. This approach is appropriate when broad spectrum fungicides are used. However, as new chemistries with more limited spectra of action are introduced the particular compliment of species causing fruit rot becomes very important (Fig. 1). Recently, registration of fenbuconazole and azoxystrobin was completed and combinations of these two modes of action provide a greater spectrum of action and improved disease control than either fungicide alone (Oudemans and Vaiciunas, 2008 attached below). It is likely that as horticultural practices and breeding efforts lead to increased crop yields it will become necessary to better characterize the fruit rot community and target specific fungal species.

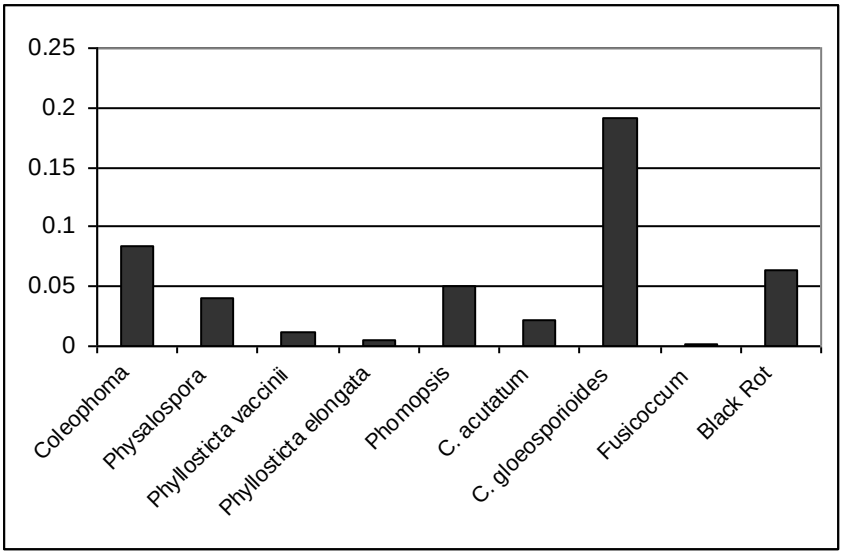


Fig. 1. Frequency fruit rotting fungi isolated from 20 commercial beds in New Jersey,

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Weidemann, G. J., Boone, D. M., and Burdsall, H. H., Jr. (1982) Taxonomy of *Phyllosticta vaccinii* (Coelomycetes) and a new name for the true anamorph of *Botryosphaeria vaccinii* (Dothideales, Dothioraceae). Mycologia 74:59-65.

Evaluation of selected new fungicides for the control of fruit rot in cranberries, 2007.

Six fungicides were evaluated for their ability to control cranberry fruit rot, a disease complex. Three of the fungicides were being tested for the first time. Proline (prothioconazole) showed activity in 2006 and was being tested again to confirm activity. Indar (fenbuconazole) and Abound (azoxystrobin) are currently labeled for cranberry fruit rot nationwide. Both of these registered materials have limited spectra of action and gaps in activity have been observed. Therefore, a tank mix of these fungicides (at full, labeled rates) was tested to determine if they were complimentary in activity. The study was conducted at the Marucci Center for Blueberry and Cranberry Research and Extension, Chatsworth, NJ in a 0.2ha cranberry bed maintained under commercial conditions, but without fungicide usage. The bed was established in 1972 with the cultivar Early Black. The site was irrigated as needed to prevent frost, heat and drought stress. Insecticide and fertilizer applications were made according to recommended crop management strategies. Plots were 1.2m by 1.2m and arranged in a randomized complete block design with eight replications. Fungicides were applied in water equivalent to 1215 liters/ha with a CO_2 powered sprayer at 207Kpa using a single TeeJet 8002VS flat fan nozzle. Treatments were initiated on 15 Jun 07 when plants were at 50% open bloom and reapplied on 27 Jun and 4 Jul. Cranberry fruit rot was first observed in mid-Jul and disease pressure was high throughout the study. An initial evaluation of fruit rot was conducted 24 Jul by counting fruit on twenty uprights from each plot. Percent fruit rot was expressed as the number of rotted fruit divided by the total number of fruit on twenty uprights. There were no differences among treatments for the total numbers of fruit however; the non-treated control had begun to express fruit rot symptoms. Plots were harvested on 9 Oct. Following harvest, the fruit were separated into two categories (sound and rotted) and the weight of each category was measured. Percent fruit rot was

calculated as the weight of rotted berries divided by the total weight of berries multiplied by 100. Yield was measured by taking the weight of sound berries per sq ft and converted to bbl/A. Data were subjected to analysis of variance and a means separation test (Student-Newman-Kuels, 5%). Distinguish, AEC656948 and Omega did not provide any significant level of control as compared with the non-treated control. Vines treated with Distinguish appeared red and unusually erect on 27 Jun and by 4 Jul symptoms were obvious. By harvest time these effects had disappeared. Abound provided an intermediate level of control. As standalone fungicides Proline and Indar provided the greatest levels of control however, the tank mix of Abound and Indar provided statistically similar control. This tank mix did result in a significantly greater yield.

	------% Fruit rot------				Harvest data (9 Oct.)			
Treatment and rate/A	24 Jul		9 Oct		Yield bbl/acre[x]		Avg berry wt[y], g	
Non-treated control	14.9	a[z]	83.2	a[z]	16.1	d	1.02	ab
XXX 480SC 5.7 fl oz….	5.8	b	29.4	c	97.0	b	1.10	ab
XXX 480SC 18 fl oz	7.2	b	76.6	a	26.8	cd	0.97	b
XXX	8.0	b	73.5	a	37.4	cd	1.06	ab
XXX 500SC 1.25 pt	10.6	ab	78.9	a	29.6	cd	0.84	c
Abound 2.08SC 15.2 fl oz	5.5	b	55.8	b	58.6	c	1.10	ab
Indar 75WSP 4.0 oz	6.6	b	27.5	c	108.6	b	1.12	ab
Abound 2.08SC 15.2 fl oz + Indar 75WSP 4.0 oz	3.8	b	14.7	c	175.9	a	1.18	a

[x]Barrels per acre
[y]Weight of 100 berries was taken and the average calculated
[z]Column numbers followed by the same letter are not significantly different at P=0.05 as determined by the Student-Newman-Kuels test

2009 Experiment and Field Demonstration

Experiment 1. Evaluation of combinations of Indar and Abound to test for synergistic activity

Objective: To test Abound and Indar at three concentrations in all combinations to determine if they act in an additive or synergistic manner.

Abound fl.oz./acre	Indar 2F fl.oz./acre			
	0	1	2	4
0	T1	T2	T3	T4
3.4	T5	T6	T7	T8
7.7	T9	T10	T11	T12
15.4	T13	T14	T15	T16

Update on Chemical Control of Flowering to Enhance Bed Establishment and Reduce Fungal Inoculum

James Polashock and Peter Oudemans

Introduction

New cranberry beds are usually started with rooted cuttings or pressed in vines. Establishment and the time to first production harvest vary depending on such factors as planting density, fertilizer regime and cultivar, but at least 2-3 years is typical. During the first two years, inhibition or elimination of fruiting could be advantageous for several reasons. First, eliminating the fruit load will shift allocation of plant resources to vegetative growth. Second, we have shown that open ground in cranberry beds allows the establishment of undesirable seedlings from dropped and rotted fruit. Thus elimination of fruiting in the early stages of bed establishment will help preserve cultivar purity. Third, many fruit rot pathogens sporulate on infected fruit and then overwinter on vegetative tissue. Thus, eliminating the unharvested fruit could reduce build up of fungal inoculum.

Objective

The objective of this project is to eliminate flowers and/or fruit in establishing cranberry beds. When we first started this project, we tried two approaches 1) 'burn' flowers and/or young fruit using chemical treatment such as ammonium thiosulfate and 2) prevent flowering and/or fruiting using plant growth regulators such as ProGibb. Our preliminary data suggested approach 2 to be the most viable and treatment in 2009 was limited to the most promising candidate in this category, ProGibb.

Treatments

We selected two different sources of material. The first source is now a 3-year old bed of rooted cuttings of 'Crimson Queen' and 'Stevens' (Bog 3). The second source is an established bed of 'Stevens' (Bog 6). The treatments used in 2008 were as follows: 1) Ethephon, 2) ProGibb, 3) Induce, 4) Ammonium Thiosulfate (ATS), and 5) Sulforix. In 2009, we used only ProGibb (two applications).

Results

Data collected in the fall 2008 showed that across both beds (3-year old and mature) and both cultivars (Stevens and Crimson Queen), that the ProGibb treatment consistently showed no phytotoxicity, increased vegetative

growth, and the lowest yields (almost no berries) as compared to the control and all other treatments. Thus, treatment this year (2009) was limited to only ProGibb as this was by far the most promising treatment. The extensive vegetative growth in response to ProGibb treatment was monitored for hardening and susceptibility to winter injury. No winter injury was observed suggesting that there is no negative effect on plant health. Some plots sprayed last year with ProGibb were not sprayed this year to determine if the effects (more vegetative growth and severe inhibition of flowering) linger for more than one year. Ideally, flowering and normal growth will resume one year after treatment.

Conclusions

Based on three years of data, only the gibberellic acid (ProGibb) treatment has the potential to safely accomplish the objective. We have shown that we can 1) dramatically reduce the occurrence of unwanted fruit and 2) dramatically increase vegetative growth (a benefit when establishing new beds) with no ill effects (i.e. no phytotoxicity or increased susceptibility to winter injury or disease).

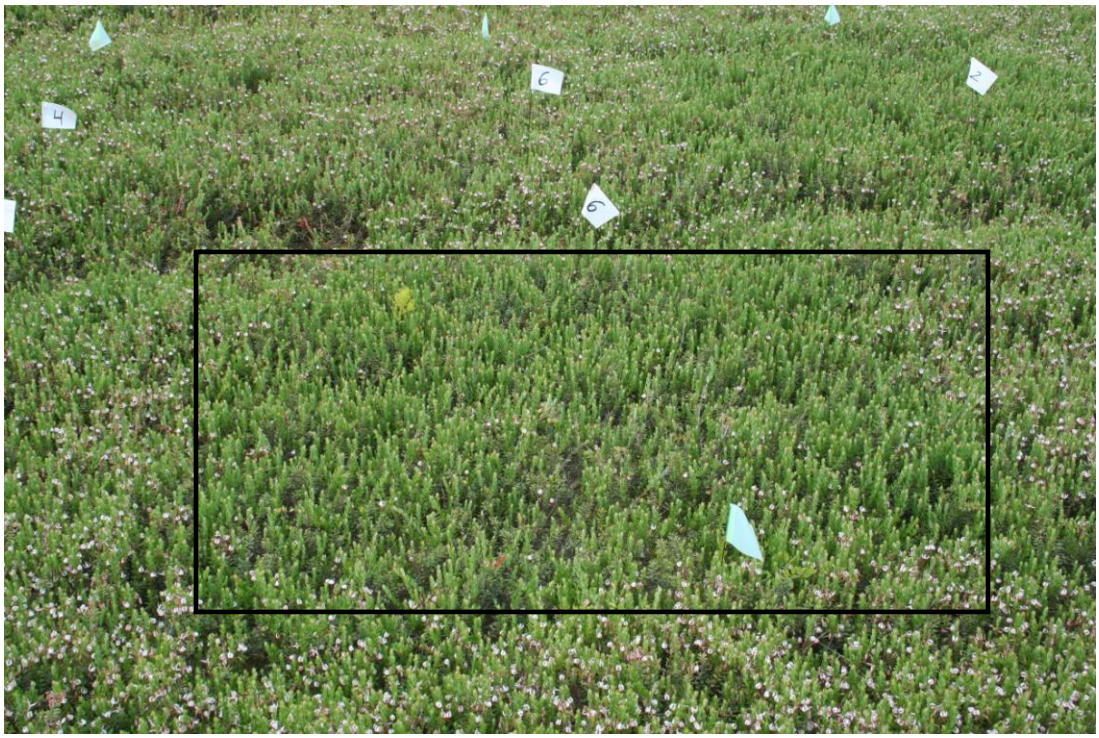


Figure 1. ProGibb Treatment of ‘Crimson Queen’ (boxed area). Note the absence of flowers and increased runner growth.

Honeybees, wild bees, and the mechanics of cranberry pollination.

Dan Cariveau—Postdoctoral Research Associate
Rachael Winfree—Assistant Professor
Department of Entomology
Rutgers University
New Brunswick, NJ 08901

Cranberry fruit production relies on the transfer of pollen grains from the anthers (male structure) to the stigmas (female structure) of the flower. Pollination in cranberry is carried out almost solely by bees with managed honeybees being the most abundant pollinators. While honeybees are critical to ensure high yields of cranberry, native, wild bees also pollinate and may play an important role in fruit production. Recent declines in honeybee colonies due to *Varroa* mites and Colony Collapse Disorder have highlighted the importance of understanding the role of native bees in cranberry pollination. The goals of this study were to 1) quantify the contribution of honeybees and native bees to cranberry pollination and 2) examine how attributes of cranberry farms and the surrounding landscape influence the abundance and diversity of wild bees.

OBJECTIVE 1: Quantify the contribution of honeybees and native bees to cranberry pollination.

Numerous bee species visit cranberry flowers yet each may differ in their effectiveness as pollinators. Pollinator effectiveness is a product of the frequency at which the pollinator visits flowers (visitation rate) and the average number of pollen grains they transfer on each visit. In the summer of 2009, we recorded the visitation rate of various bee species on 32 cranberry bogs throughout central New Jersey. In addition, we collected bees to determine bee species abundance and variety. We recorded approximately 25 wild bee species visiting cranberry flowers. Honeybees were the most

frequent pollinator and accounted for 73% of the visits. Native bees made up 25% of the visits with wasps and flies comprising roughly 2%. Of the native bees 66% were bumblebees (Genus *Bombus*) and 34% were other bee species. In the summer of 2010, we plan to conduct experiments to determine the number of pollen grains deposited per visit by each bee species, and to calculate the contribution that each type of bee makes to cranberry pollination.

OBJECTIVE 2: Determine how landscape factors such as proximity to natural habitat and proportion of surrounding area in cranberry production influence the abundance and diversity of wild bees.

Wild bees that visit cranberry must feed and nest entirely on the landscape within and surrounding bogs. Variation in landscape attributes may influence bee abundance, diversity and subsequently cranberry pollination. To examine landscape factors, we used GIS to locate bogs that 1) ranged in proportion of surrounding landscape in cranberry production and 2) were close or far from woodlands. At these bogs, we conducted visitation rate observations and collected wild bees (as described above). We also collected stigmas to quantify the number of pollen grains deposited per stigma at each of these bogs. This will allow us to directly link landscape attributes to visitation rate, wild bee abundance and diversity, and pollination.

JUST HOW MUCH EXPOSURE DO I HAVE TO PESTICIDES ON THE FARM?

By Raymond J. Samulis, Burlington County Agricultural Agent

Pesticide applicator licensing has been with us for more than 30 years now. Yet we still have many unanswered questions about evaluating our repeated exposure to various pesticides. For acute exposure to pesticides the circumstances are usually obvious. We know when we get spray material in our eyes, see stains on our clothing, get headaches, dizzy, and so on that we have an immediate problem. With organophosphate pesticides, we can get a cholinesterase blood tests at the beginning of the season to see if we are getting in trouble.

I think that the more nagging question regarding pesticide exposure deals with our continual chronic exposure. What happens to us when we are exposed daily, weekly, monthly or yearly to minute amounts of various pesticides?

The amount of our pesticide exposure vulnerability will vary according to the method of application. If we are handgun spraying, weed wiping or tractor spraying our vulnerability to exposure will have a wide range. Likewise, exposure to pesticides from seed treatments generally has a low hazard rate associated with their use. A recent pesticide exposure study of farmers conducted by Iowa and North Carolina has produced interesting results. Overall, 14% of the farmers and farm workers were shown to have high exposure to pesticides on their farms.

This study was able to conclude that the application in this highly exposed category had these things in common:

- Stored pesticides in their homes;
- Repaired their own equipment;
- Delayed changing clothes and washing;
- Applied pesticides within 100 yards of their houses;
- Washed in their houses versus in an outside building;
- Mixed pesticides within 50 yards of a well;
- Mixed work clothing and family laundry together.

It was startling to learn that more than 94% of farmers washed their family laundry in the same machine as their work clothes. This study was also unique in that it studied the change in pesticide use over the years and was less concerned with old, historic pesticide use.

Probably the most useful aspect of the study was that it resulted in production of a simple system to measure your exposure to pesticides over time. This formula ultimately can help you answer the question posed in the title of this presentation.

The formula specifically rates four distinct areas of exposure and comes up with a numerical rating to evaluate problem areas. These areas include mixing and loading, application methods, whether you repair your own equipment, and how extensive is your use of personal protection equipment. In the exposure category, factors range from 9 for handgun spraying down to 1 for granular application. Mixing and loading pesticides are given ratings of 0 through 9 depending upon the frequency of mixing. The repair category is given a 2 X rating to those farmers who repair their own equipment. Finally a range of .1 to 1 is given to personal protection equipment with .1 used for maximum use of equipment to 1 for no use of personal protection equipment.

This information can also be used to calculate a lifelong exposure formula with a few additions.

Let's face it, whether acute or chronic, pesticide exposure can cause us serious health effects. It's in all of our best interest to use formulas like these to determine ahead of time just how vulnerable we are to needlessly damaging our health.

Maintaining Cultivar Purity

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

Maintaining cultivar purity is a continual challenge for both the cranberry grower and cranberry researcher. In a production bed, cranberry contaminants, or off-types, can reduce yield, quality and vigor of the bed (see "**A DNA fingerprinting study of Washington State and Newfoundland 'Stevens': is 'Stevens' becoming more contaminated with off-types"**). These contaminants can come in with vines used to establish a new bed, or as volunteer seedlings, particularly when disease or other problems leave an open area in a bed. Unfortunately, the off-types are often highly vegetative and crowd out more productive vine.

For the cranberry researcher, contaminants can seriously confound results. In 1995, Rutgers cranberry breeding program established two beds containing an extensive germplasm collection, where each plot was propagated from a single stem to ensure 100% genetic homogeneity within each plot. In the past few years, it has become apparent that despite our efforts to maintain purity, these beds now show signs of contamination. The germplasm was collected in 1988 through 1994 from bogs throughout the U.S. (NJ, NY, MA, DE, WV, PA, MI, and WI), and includes both major and minor cultivars, genetic variants that had developed in cultivated beds many decades old, and wild cranberries collected from a diverse range of habitats. Alleys between each 5' x 5' plot were maintained with regular herbicide applications. This germplasm collection is a valuable resource for our breeding program. Within it we have identified accessions with fruit rot resistance, high sugars, low acids, and other traits of interest which have been used in crosses and new cultivar development.

To re-establish this collection, we examined each plot in September 2007 and selected one piece of vine with fruit attached that looked typical to the plot. These individual vines were rooted in the greenhouse, propagated into 25 plants, and will be replanted in a new 5' x 5' plot in April 2010. Plants were DNA fingerprinted to confirm their identity and assure that they are the same accession originally planted in 1995. Once established, these new plots will serve as a resource to researchers here at Chatsworth and around the country.

Cranberry – Update on Health Benefits

Amy Howell

Cranberry is well established as a "super fruit," with a wide array of potential health benefits, the most substantiated being prevention of urinary tract infections. Cranberries contain a number of phytochemicals, among them anthocyanin pigments, flavonol glycosides, organic acids, and complex oligomeric flavonoids known as proanthocyanidins (PACs) or condensed tannins. PACs appear to be particularly bioactive and, in recent years, have gained the attention of the medical and pharmaceutical communities for their wide array of potential health benefits. The PACs in cranberry are of interest in that they have unusual molecular structures when compared to PACs from other foods and have been linked to prevention of bacterial adhesion in the urinary tract, stomach, and oral cavity. Bacterial adhesion to cells is the initial step in many bacterial infection processes. If the initial adhesion step is inhibited, the bacteria are not able to multiply and colonize, essentially preventing infection. The role of cranberry in preventing bacterial adhesion in the urinary tract, gastrointestinal tract, and oral cavity will be reviewed, as well as the emerging research into the benefits of cranberry on markers for heart disease and cancer.

Biology and Management of *Rhizoctonia/Thanatophytum*, the Causal Agent of Cranberry Fairy Ring Disease

The Fairy Ring Team includes:

Rutgers University:
Ms. Jennifer Vaiciunas
Dr. Peter V. Oudemans

Cooperators and Institutions:
Dr. James Polashock, USDA-ARS, Beltsville, MD
Dr. Frank Caruso, University of Massachusetts

Fairy Ring is a re-emerging disease on cranberry. We have recently identified the causal agent and now have the opportunity to develop a new management strategy. Fairy Rings cause not only direct crop losses but also provide an entry point for weed species and promote development of cranberry seed banks which lead to development of rogue cranberry genotypes that can shorten bed life. We are developing improved fairy ring management strategies aimed at reducing spread of the disease to new beds and new cranberry growing areas as well as to investigate control procedures to help arrest the development of existing rings. In the short-term we are attempting to identify fungicide control methods to reduce the expansion of Fairy Rings. Ferbam used at a rate of 0.9lb/100ft2 will be eliminated and replaced by lower impact fungicides used at lower rates. We have developed methods to diagnose the disease and determine how new rings are being formed. The benefit will be that dispersal to new beds and other growing regions will be prevented or reduced. When successful controls are developed it is likely that the life-span of individual cranberry beds will be increased. Long-term objectives that will be initiated under this proposal include an elucidation of the mechanisms for dispersal and investigation of biological control methods.

A CHEMICAL ECOLOGY LAB FOR BLUEBERRY & CRANBERRY ENTOMOLOGY

Cesar Rodriguez-Saona, Extension Specialist, Rutgers Entomology

Plant volatiles serve as a source of airborne chemicals in insect communication. Insects may use plant volatiles to locate food and mates. Females may also use these chemicals to locate oviposition sites. Because these chemicals play an integral role in the insect's life, they can be used for insect control. A laboratory for the study of plant volatiles and insect response to these chemicals has been established at the P.E. Marucci Center, Rutgers University in Chatsworth, NJ. The laboratory accommodates equipment for the collection and analyses of plant volatiles, electro-antennographic detection, and insect's behavioral response to plant volatiles (repellency and attraction). We are currently studying the response of cranberry fruitworm and cranberry weevil to host-plant volatiles to develop better tools for monitoring these insect pests.

2010 Annual Summer Meeting of the American Cranberry Growers Association

Rutgers P.E. Marucci Center

Chatsworth, NJ

Thursday
August 19, 2010

RUTGERS
New Jersey Agricultural Experiment Station

American Cranberry Growers Association
2010 Summer Field Day
Thursday August 19, 2010
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 3)**

8:30–8:40 **Opening Remarks**
Stephen V. Lee, IV President, American Cranberry Growers Association

8:40–8:50 **2010 Cranberry Statistics – An Update**
Troy M. Joshua, USDA, NASS

8:50–9:10 **Cranberry Pollination: Wild Bees, Honeybees, and the Mechanics of Pollen Delivery (Bog 3)**
Dr. Daniel P Cariveau, Postdoctoral Research Associate, *Dr. Rachael Winfree*, Assistant Professor, Department of Entomology, Rutgers University

9:10–9:25 **Performance of Rutgers New Cranberry Varieties: Crimson Queen®, Mullica Queen® and Demoranville® (Bog 3)**
Dr. Nicholi Vorsa, Professor, *Dr. Jennifer Johnson-Cicalese*, Research Associate, Department of Plant Biology and Pathology, Rutgers University

9:25–9:45 **GA treatment to enhance bed establishment (Bog 6)**
Dr. James Polashock, Research Plant Pathologist, USDA-ARS, *Dr. Peter Oudemans*, Associate Professor, Department of Plant Biology and Pathology, Rutgers University

9:45-10:05 **Evaluating New Cranberry Selections for Fruit Rot Resistance and Yield (Bog 17)**
Dr. Jennifer Johnson-Cicalese, Research Associate, *Dr. Nicholi Vorsa*, Professor, Department of Plant Biology and Pathology, Rutgers University

10:05-10:35 **2010 Entomology Research and Trials with New Insecticides (Bogs 19)**
Dr. Cesar Rodriguez-Saona, Department of Entomology, Rutgers University

POLE BARN:

10:45–11:15 **Fairy Ring Disease of Cranberry: Dissecting the Life Cycle and Development of Control Strategies**

Jennifer Vaiciunas, Research Technician, *Dr. Peter Oudemans*, Associate Professor, Department of Plant Biology and Pathology, Rutgers University, *Dr. James Polashock*, Research Plant Pathologist, USDA-ARS

11:15–11:45 **Pesticide Applicator Safety**

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

11:45–12:00 **Equipment Dealers/Company Presentations**

12:00–1:00 **LUNCH**

1:00–2:00 **Equipment Display**

CRANBERRY POLLINATION: WILD BEES, HONEYBEES, AND THE MECHANICS OF POLLEN DELIVERY

Daniel Cariveau and Rachael Winfree

Department of Entomology, Rutgers University, New Brunswick, NJ

Fruit production in cranberry is dependent upon pollination - a service provided primarily by bees. Managed honeybees are the primary pollinators of cultivated cranberry. While they are often less numerous, wild bees, such as bumblebees are also important pollinators of cranberry. Wild bees rely on the area surrounding farms for nesting sites and food resources when cranberry flowers are not in bloom. In 2009 and 2010, we collected bees at 16 sites in New Jersey to determine how the amount of cranberry agriculture surrounding a bog influenced wild bee populations. In 2009, we found over 45 species of wild bees. The overall abundance of bees was not affected by the amount of land in cranberry production. Individual bee species differed in their response. Some species showed an increase in numbers with more land in cranberry agriculture while others decreased.

The average effectiveness of each bee species for pollinating cranberry is a function of the number of individuals of that species visiting cranberry combined with the number of pollen grains an individual bee delivers during each visit. To assess pollinator effectiveness, in 2010 we measured the number of pollen grains delivered by honeybees and wild bees to cranberry flowers.

To augment wild bee populations in agricultural settings, the National Resource Conservation Service (NRCS) has constructed flower plantings at sites throughout New Jersey. In the future, we will be assessing the efficacy of these plantings for providing food resources for wild bees. A number of wild bee species, including the highly effective bumblebees, need floral resources before and after cranberry bloom to maintain their populations. By understanding the value of these plantings we hope to be able to recommend simple, inexpensive techniques that will increase population sizes of the most effective wild bee species in cranberry bogs and thus augment essential pollination services.

PERFORMANCE OF RUTGERS NEW CRANBERRYS: CRIMSON QUEEN®, MULLICA QUEEN® AND DEMORANVILLE® VARIETIES

Nicholi Vorsa and Jennifer Johnson-Cicalese

P.E. Marucci Center, Department of Plant Biology and Pathology, Rutgers University

In June 2006, Bog 3 was planted for the purpose of doing management studies on large replicated plots of the Rutgers new Mullica Queen (CNJ97-105-4; US PP19,434 P3), Crimson Queen (NJS98-23; US PP18,252 P3), and Demoranville (NJS98-35; US PP18,911 P2) varieties, along with the standard cultivar, Stevens. Rooted cuttings (1/ft^2) were used to plant four replications of each variety in 20' x 45' plots. In 2009, the trial was fully established so two 1ft^2 samples were harvested from each plot on September 15 and 25, and yield, fruit size, fruit rot, TAcy, Brix, and titratable acidity were determined.

For yield in 2009, Mullica Queen, Crimson Queen, and Demoranville all performed significantly better than Stevens. Mullica Queen had the highest yield (418g/ft^2), more than twice as high as Stevens, while total anthocyanin (TAcy) was equivalent to Stevens. Demoranville and Crimson Queen had TAcy values three times as high as Stevens on September 15. Crimson Queen exhibited higher fruit rot in the September 25 harvest. Crimson Queen comes into bloom earlier (3-4 days) than Stevens, and will require earlier fungicide applications. Mullica Queen also comes into bloom earlier than Stevens, but did not appear to exhibit higher fruit rot.

Performance of cultivars in Bog 3 in 2009

		15-Sep						25-Sep					
	Mean Yield g/ft^2	Total Yield g/ft^2	Fruit wt g/fruit	% fruit rot	Tacy mg/ 100g frt	BRIX % solids	% Titrat. acid	Total Yield g/ft^2	Fruit wt g/fruit	% fruit rot	Tacy mg/ 100g frt	BRIX % solids	% Titrat. acid
Mullica Queen	418.9 a	375.6	2.5	4.0	7.6	8.9	2.60	462.2	2.6	4.3	13.1	8.9	2.55
Demoranville	403.7 a	417.2	2.6	4.5	20.0	8.5	2.47	390.2	2.7	5.5	27.1	8.9	2.25
Crimson Queen	360.7 a	301.7	2.5	7.2	21.4	9.3	2.54	419.6	2.6	11.1	25.4	9.1	2.39
Stevens	190.4 b	186.6	1.9	6.4	6.5	9.4	2.66	194.2	2.1	4.1	13.9	9.4	2.65

At other locations, Rutgers new varieties continue to perform well. In established half acre test plots in Browns Mills, NJ, 2009 yields were: Mullica Queen® 419 bbl/acre, Crimson Queen® 286 bbl/acre, and Demoranville® 270 bbl/acre, while Stevens, Ben Lear and Grygleski #1, in contiguous beds yielded 320, 276 and 253 bbl/acre, respectively.

The most mature (4 yr) commercial beds of Crimson Queen® in Wisconsin yielded 416 and 628 bbl/acre. Three and four year old beds of Demoranville® in Wisconsin yielded 380 and 474 bbl/acre, respectively. The three varieties have now been planted in Massachusetts, Michigan, New Jersey, Oregon, and Washington State in the US; and in British Columbia, Quebec, and Nova Scotia in Canada. With several hundred acres coming into production soon, we will have the opportunity to evaluate the new varieties' performance under varied climates and conditions.

A description of each variety is given below (Excerpted from **Fruit and Nut Register List 45;** HORTSCIENCE VOL. 45(5) MAY 2010):**CNJ97-105-4** (**Mullica Queen**®). Midseason cultivar with very high production potential. **Origin:** Rutgers University, NJAES, Chatsworth, NJ by N. Vorsa and J. Johnson-Cicalese. Lemunyon x No. 35; cross 1997; selected 2000; introd. 2007. US PP19,434 P3, 11 Nov 2008, Canada PBR applied for. **Fruit:** large over 2g in NJ, WI; widely elliptic, with rounded to square stem end and rounded calyx end, Tacy typically 15% higher than Stevens. **Skin:** shiny, with little to no bloom. **Plant:** vine stolons and uprights moderate

NJS98-23 (**Crimson Queen**®). Early season, large fruited, early high anthocyanin content, exceptional vegetative vigor, highly productive cranberry cultivar. **Origin:** Rutgers University, NJAES, Chatsworth, NJ by N. Vorsa. Stevens x Ben Lear; cross 1988; selected 1998, tested as NJS98-23; introd. 2006. US PP18,252 P3, 27 Nov 2007; Canada PBR applied for. **Fruit:** large over 1.9g in NJ, WI; elliptic, with rounded to slightly pointed stem end, and rounded calyx end, Tacy typically 50% > than Stevens. **Skin:** shiny, bloom around calyx end, otherwise with little to no bloom. **Plant:** vigorous stolon production; vines moderately coarse; early flowering phenology (2-3 days advanced relative to Stevens), fruit-rot susceptibility similar to Ben Lear.

NJS98-35 (**Demoranville®**). Early season, large fruit, early high fruit anthocyanin content, highly productive cranberry cultivar. **Origin:** Rutgers University, NJAES, Chatsworth, NJ by N. Vorsa. Franklin x Ben Lear; cross 1988; selected 1998; introd. 2007. US PP18,911 P2, 10 Jun 2008; Canada PBR applied for. **Fruit:** large, over 2g in NJ, WI; elliptic, with rounded to slightly pointed stem end, and slightly protruding calyx, Tacy typically 60% higher than Stevens, lower titratable acidity than Stevens. **Skin:** shiny with little to no bloom, except waxy bloom around calyx. **Plant:** moderately vigorous stolon production; uprights moderate coarseness; early flowering phenology (1-2 days advanced relative to Stevens); appears less fruit-rot susceptible than Ben Lear. Named in honor of I.E. Demoranville, Univ. Massachusetts Cranberry Station, MAES, East Wareham, MA.

GIBBERELLIC ACID TREATMENT TO ENHANCE BED ESTABLISHMENT

James Polashock[1] and Peter Oudemans[2]

[1] USDA ARS, Chatsworth, NJ, U.S.A
[2] PE Marucci Center, Rutgers University, 125a Lake Oswego Road, Chatsworth, NJ, U.S.A.

Introduction

We initiated a project four years ago to inhibit flowering in cranberry during the establishment years. Inhibition or elimination of flowering and fruiting could be advantageous for several reasons. First, eliminating the fruit load will shift allocation of plant resources to vegetative growth. Second, we have shown that open ground in cranberry beds allows the establishment of undesirable seedlings from dropped and rotted fruit. Thus, elimination of fruiting in the early stages of bed establishment will help preserve cultivar purity. Third, many fruit rot pathogens sporulate on infected fruit. Eliminating the unharvested fruit is predicted to reduce build up of fungal inoculum.

Objective

The objective of this project is to eliminate flowers and/or fruit in establishing cranberry beds. When we first started this project, we tried two approaches 1) 'burn' flowers and/or young fruit using chemical treatment such as ammonium thiosulfate and 2) prevent flowering and/or fruiting using plant growth regulators such as gibberellic acid and abscisic acid. Our preliminary data suggested approach 2 to be the most viable and treatment in 2009 (and 2010) was limited to the most promising candidate in this category, ProGibb (a commercial product containing gibberellic acid).

Treatments

We selected two different sources of plant material. The first source is now a 4-year old bed of rooted cuttings of 'Crimson Queen' and 'Stevens' (Bog 3). The second source is an established bed of 'Stevens' (Bog 6). We have also planned treatment for newly planted beds in 2010. ProGibb was typically applied in two applications (one at the end of July and one at the start of August).

Results

Data collected in the fall 2009 showed that across both beds (3-year old and mature) and both cultivars (Stevens and Crimson Queen), that the ProGibb treatment consistently showed no phytotoxicity, increased vegetative growth, and the lowest yields (almost no berries) as compared to the control. The extensive vegetative growth in response to ProGibb treatment was monitored for hardening and susceptibility to winter injury. Winter injury was observed this year (winter 2009-2010) as evidenced by browning of vegetative tissue and leaf drop. However, the runners were not killed and the plants fully recovered. We also noticed that beds receiving the normal fertilizer regime sometimes appeared to be yellowing. We determined that this was not a phytotoxicity response, but rather evidence that more fertilizer is required to support the extensive vegetative growth increase.

Conclusions

Based on four years of data, only the gibberellic acid (ProGibb) treatment has the potential to safely accomplish the objective. We have shown that we can 1) dramatically reduce the occurrence of unwanted fruit and 2) dramatically increase vegetative growth. Although some winter injury was evident this year, the plants recovered and obvious injury is no longer visible.

Future Plans

Overall, we are convinced of the efficacy and safety of this approach. We hope to begin grower recommendations following additional data collection. Registration issues will be pursued.

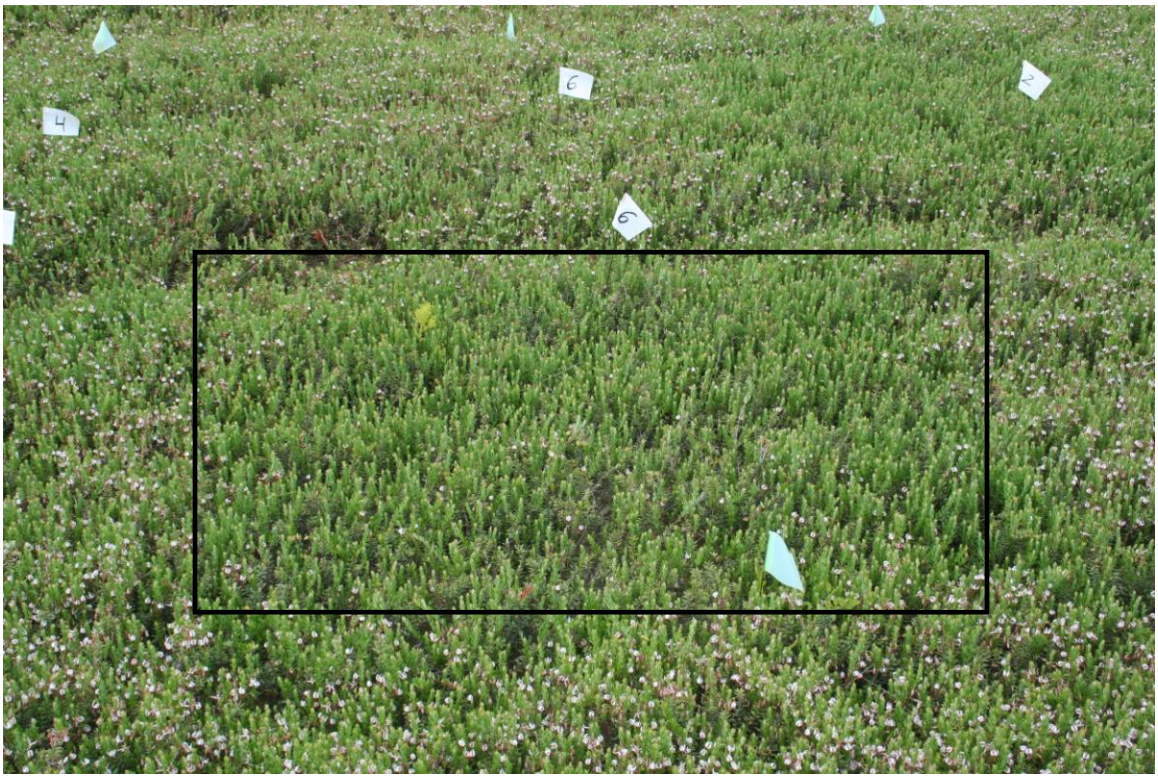


Figure 1. ProGibb Treatment of 'Crimson Queen' (boxed area). Note the absence of flowers and increased runner growth.

EVALUATING NEW CRANBERRY SELECTIONS FOR FRUIT ROT RESISTANCE AND YIELD

Jennifer Johnson-Cicalese, Nicholi Vorsa, Karen DeStefano and Sue Vancho

P.E. Marucci Center, Department of Plant Biology and Pathology, Rutgers University

In June 2003, 80 advanced cranberry selections were planted in a trial for evaluation as possible new varietal releases. These advanced selections represent the best of 6585 progeny that had been evaluated during the previous 10 years, in five progeny evaluation trials. The parents of the progeny include named varieties such as Stevens, Ben Lear, Black Veil, Franklin, Pilgrim, Early Black, Bergman, #35, and Wilcox; selections from previous breeding and selection cycles; as well as several germplasm accessions that showed exceptional performance in some particular trait, such as fruit chemistry or yield.

Each selection was established from rooted cuttings (1/ft^2) in 10'x10' plots, replicated three times, and maintained with standard practices. The varieties, Stevens and Ben Lear, were included in the trial for comparison. In 2004 and 2005, the trial was rated for establishment. In 2006 through 2009, the trial was evaluated for yield, % fruit rot, fruit size, total anthocyanin (TAcy), soluble solids (Brix), and titratable acidity. Fruit samples (1ft^2) were harvested from each plot in September and October.

Several advanced selections have exhibited consistently better performance, including yields 30% higher than Stevens, and good color and fruit size. These promising selections have recently been planted in larger trials under grower conditions in New Jersey, Washington, Oregon, and/or Wisconsin. Future plans include additional yield and fruit chemistry evaluations, and testing for specific phenolic compounds. Fruit rot resistance will be rated in the future by withholding fungicides. Other traits evaluated will be fruit storage life, and possible testing of insect resistance.

2010 ENTOMOLOGY RESEARCH AND TRIALS WITH NEW INSECTICIDES

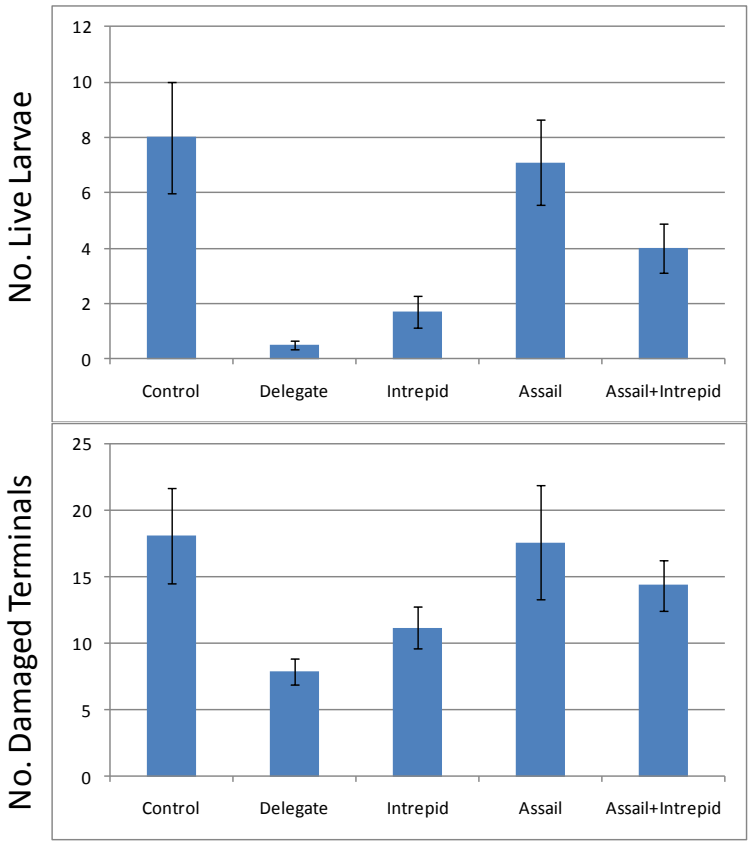
Cesar Rodriguez-Saona[1], Robert Holdcraft[1], Vera Kyryczenko-Roth[1], and Dan Schiffhauer[2]

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

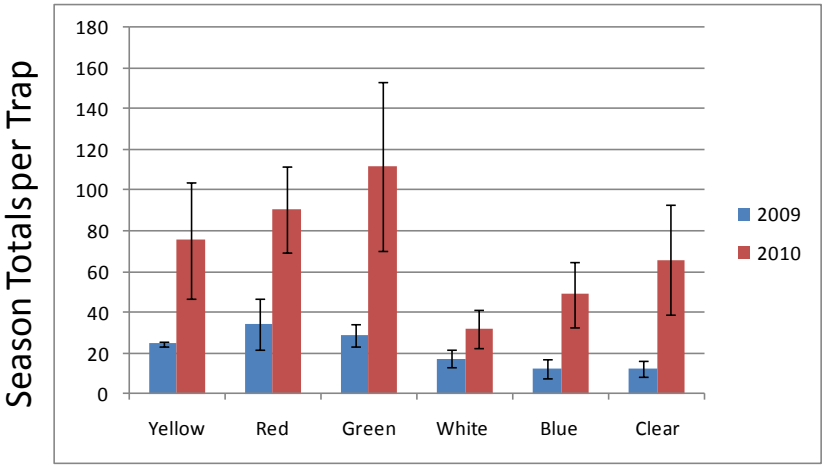
Here are the entomology highlights of this year's cranberry season:

- After experiencing high gypsy moth populations in 2007 and 2008, and a big decline in numbers in 2009, the gypsy moth outbreak is finally over. As a result, growers did not need to apply insecticides to control this insect in 2010.
- Early in the season, some farms experienced areas of high blackheaded fireworm, *Sparganothis* fruitworm, and cranberry blossomworm that required treatment. Some farms also had to treat for *Sparganothis* fruitworm after bloom. Now that the gypsy moth outbreak is over, growers need to make sure to monitor for these and other, e.g. spotted fireworm, pests in upcoming years.
- 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.).
- This year, there were a few new insecticides registered in cranberries: Belay, Oberon 2SC, and Rimon 0.83EC. However, we do not have 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. I will keep growers updated on the status of MRLs for these newer products in upcoming meetings. 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.
- Future research will continue to focus on testing new insecticides with novel modes of action, particularly for fruitworm and fireworm control.

Field trial for Sparganothis fruitworm control. We evaluated the efficacy of a pre-bloom application of Assail, Delegate, and Intrepid for *Sparganothis* fruitworm control under field conditions. This study was conducted in a commercial cranberry bog with previous history of high *Sparganothis* populations. Ten 4' × 4' plots were sprayed with either Delegate at 6 fl oz/A, Assail at 5.3 fl oz/A, Intrepid at 16 fl oz/A, or Assail and Intrepid at 5.3 and 8 fl oz/A, respectively. Control plots received no insecticide applications. Applications were made with a R&D CO_2 backpack sprayer. The sprayer was calibrated to deliver 102 gal of vol per acre at 30 psi, using a single T-GET VS110015 nozzle, yielding 141 ml per plot. Treatments were applied on 20 May. A week later, number of live larvae and damaged terminals were recorded per plot. Delegate provided the best (>90%) larval control of all treatments.



New methods for monitoring blunt-nosed leafhoppers in cranberries. Field experiments were conducted to examine the attraction of blunt-nosed leafhoppers to different color traps in cranberries. This was a continuation of a 2009 study. Six colors were tested for attraction: yellow, red, green, white, blue, and clear (control) from the first week in July through the first week in August (peak adult flight). A set of six traps, one of each color, was placed in one cranberry bog. Each set was replicated 4 times. Traps were checked weekly in the lab for the presence of leafhoppers. In both years 2009-2010, higher blunt-nosed leafhoppers were caught on red and green traps than on other color traps.



FAIRY RING DISEASE OF CRANBERRY: DISSECTING THE LIFE CYCLE AND DEVELOPMENT OF CONTROL STRATEGIES

Jennifer Vaiciunas, Peter Oudemans, and James Polashock

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[2] USDA ARS, Chatsworth, NJ, U.S.A

Fairy ring is a serious disease affecting cultivated cranberries in New Jersey and Massachusetts. The disease is expressed as expanding patches of dead vines leading to long term yield loss. Recently, we observed dark infection pads associated with dying vines and subsequently isolated the pathogen and confirmed pathogenicity. Sequence analysis showed the causal agent to be a species of *Helicobasidium* (teleomorph) and the anamorph isolated from cranberry was identified as *Thanatophytum* sp. A second anamorphic phase of this pathogen, *Tuberculina*, a rust mycoparasite, may function as the recombinant stage of the pathogen life cycle. A collection of isolates from New Jersey and Massachusetts revealed a high level of diversity as determined by vegetative compatibility (VC) and molecular analyses. Isolates collected from individual rings were identical whereas most isolates collected from different rings were distinct. This suggests that an active sexual phase is responsible for dissemination. The rust mycoparasite stage is an important intermediate stage of the fairy ring life cycle. We found the *Tuberculina* stage on a rust infecting greenbrier (*Smilax* sp.), and another infectin Swamp Loosestrife (*Decodon verticilatus*) both common weeds in cranberry beds. These isolates were identical to the cranberry pathogen based on DNA sequence analysis. A complex life cycle has emerged and includes at least three distinct stages on distinct host species. Control of the rust will likely limit spread of the disease into cultivated cranberry beds.

ACGA Winter Meeting Program
Thursday, January 28, 2010

8:00-8:30 Registration and Coffee

8:30-8:40 Welcoming Remarks– **Stephen Lee IV, President, ACGA**
Treasurer's Report **- Shawn Cutts**

8:40-9:00 **2009 Cranberry Statistics**
Troy M. Joshua, USDA, NASS

9:00-9:20 **Update on the Cranberry Breeding Project**
Nicholi Vorsa, Department of Plant Biology and Pathology, Rutgers University, *Jennifer Johnson-Cicalese*, Research Associate, *James Polashock*, Research Plant Pathologist, USDA-ARS

9:20-9:40 **Advancing Along the Edge of Fairy Ring Research**
Peter Oudemans, Department of Plant Biology and Pathology, Rutgers University**,** *James Polashock*, Research Plant Pathologist, USDA-ARS

9:40-10:00 **Current Entomology Research in Cranberries**
Cesar Rodriguez-Saona, Department of Entomology, Rutgers University

10:00-10:15 Break

10:15-10:35 **Dodder Control in Cranberries**
Bradley Majek, Department of Plant Biology and Pathology, Rutgers University

10:35-11:20 TBD
Lee Fiocci

11:20-11:50 **Pesticide Safety**
Ray Samulis, Burlington County Agricultural Agent, Rutgers University

11:50-1:00 Lunch

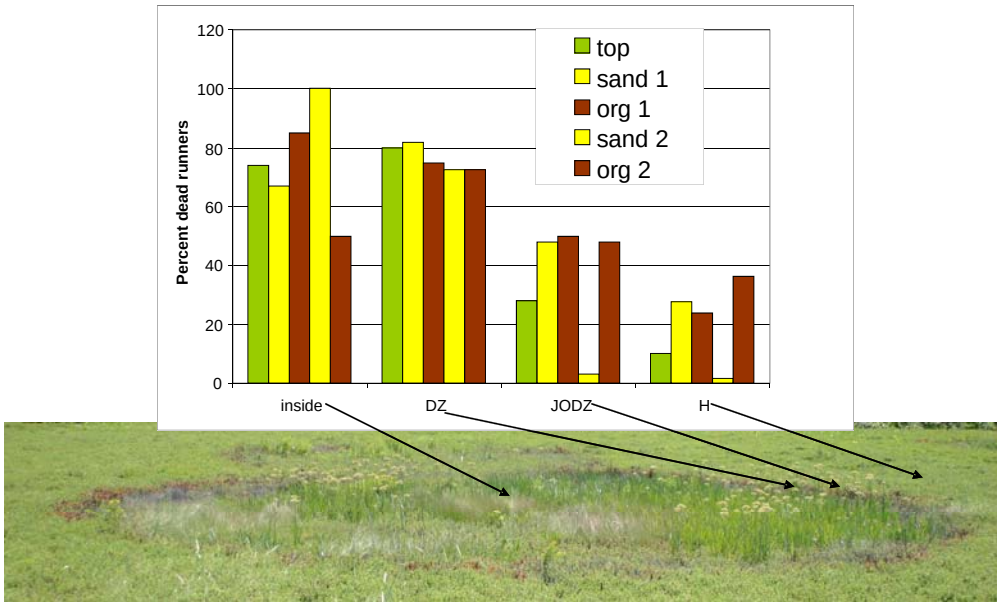
1:00-1:45 TBD
Anne Averill, Department of Plant, Soil, and Insect Sciences, University of Massachusetts

1:45 **Adjournment**- *ACGA Board of Directors Meeting*

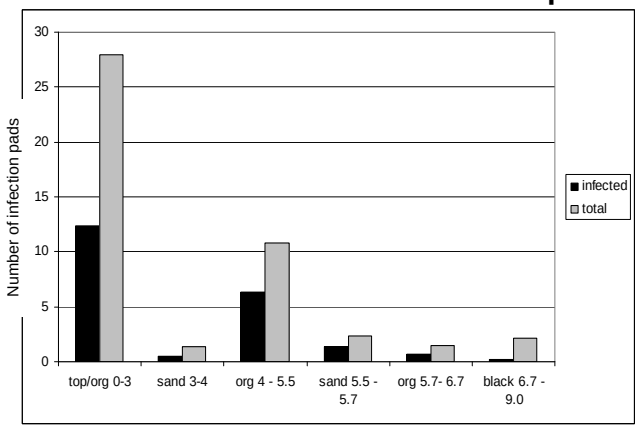
Challenges in the Control of Fairy Ring

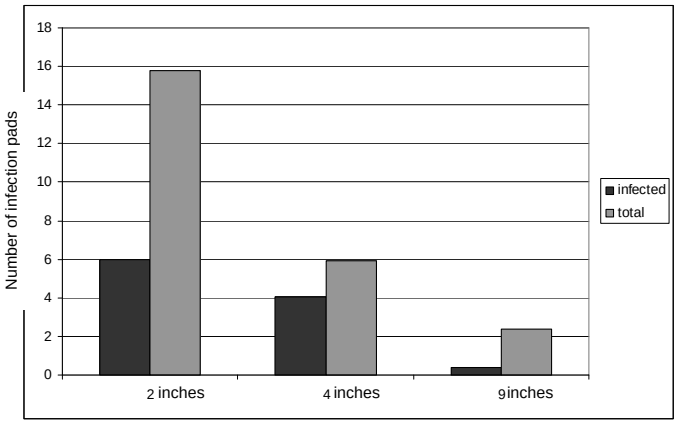
Peter Oudemans, Jen Vaiciunas and James Polashock

Distribution of symptomatic vines in a fairy ring



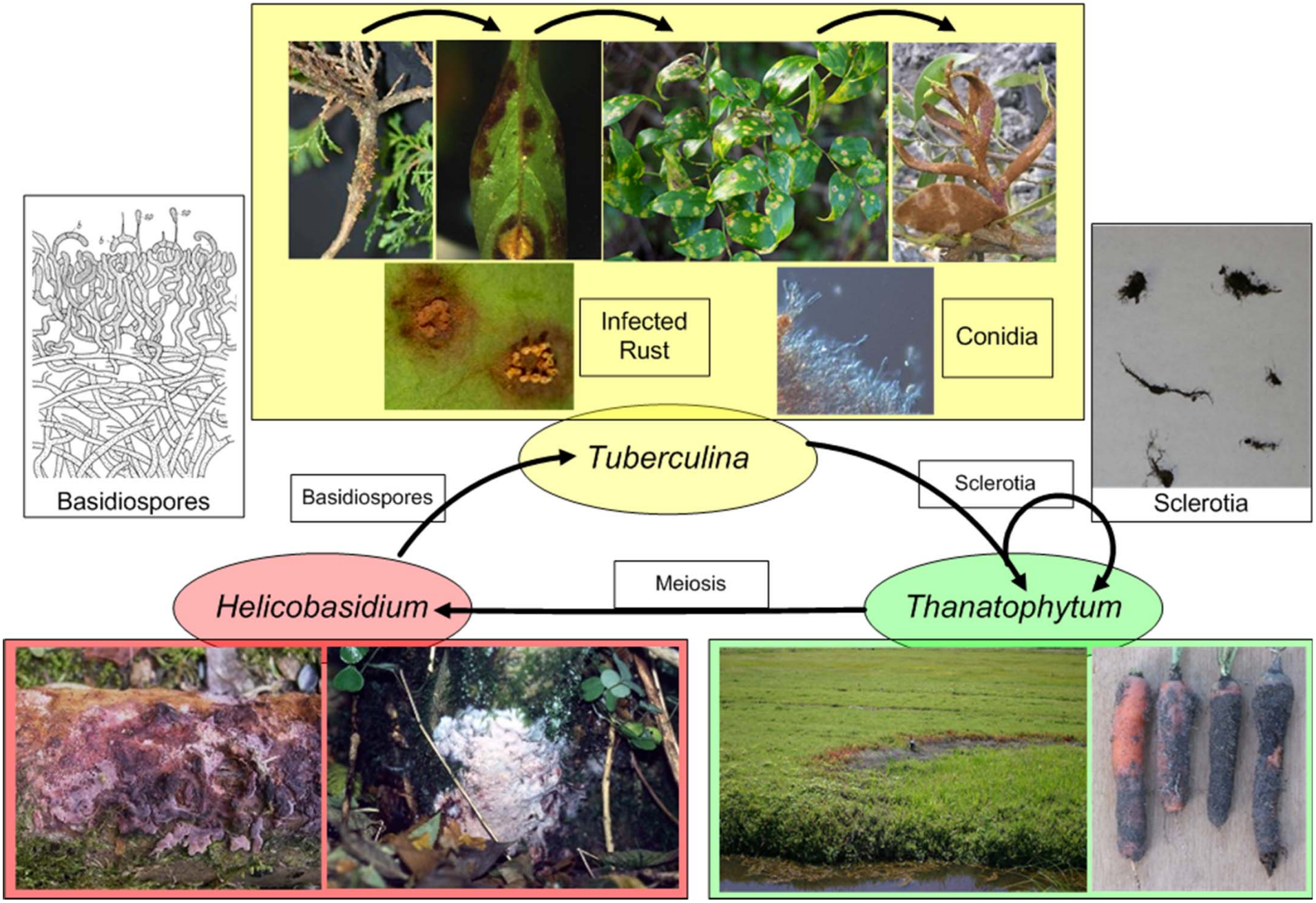
Presence of the pathogen in the soil profile





These graphs demonstrate the distribution of the fairy ring fungus in an existing fairy ring. The top graph shows that the fungus is distributed at least 10 feet beyond the symptomatic edge of the ring. The graph on the left shows the fungus is found in the organic layers more so than sand layers. The graph on the right shows the fungus is distributed down to four inches but rarely beyond that.

The Life Cycle of Fairy Ring Disease on Cranberry



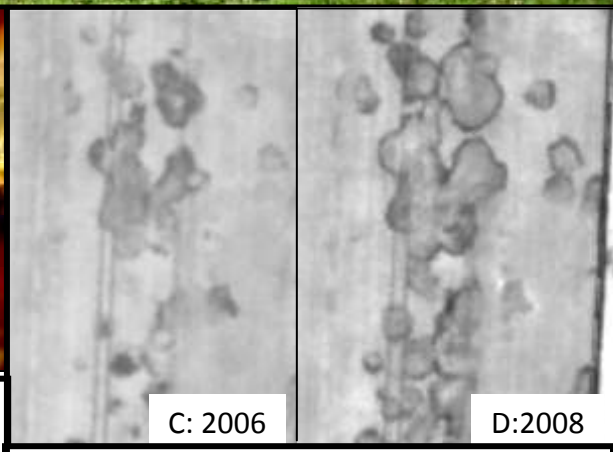
Fairy Ring Identification

This protocol will help with identification of Fairy Rings. You will need a few simple tools and most important… lots of practice. It will require a very strong magnifying glass or a small dissecting microscope as well as very fine forceps. Samples should be examined as soon as possible after collection.

- Take sample from edge of ring. Dead or dying runners are the best for seeing signs of the fungus.
- Try to get a runner that has about 12 inches or more of root development.
- If you plan to look at the runner within a few hours, do not wet it unless it is very dry.
- If you want to save the runner for a day or two, put it in a plastic bag, spray with enough water to create a mist and put it in the refrigerator.
- Observe the runner tissues under a dissecting microscope or field hand lens.
- Roots can be gently removed if they are in the way
- If there is a lot of soil on the sample, rinse gently in water and blot dry with a paper towel.
- Dark brown or black infection pads and golden colored mycelium should be present on the runner.

Typical fairy ring growing on a cranberry bed

Infection pads are signs of Fairy Ring infection. A) Infection pads on the surface of a dying runner as seen with 10X magnification. B) Infection pads seen at 20X magnification with back lighting to show the hair-like hyphae



Satellite imagery showing spread of the Fairy Ring disease on a commercial cranberry bed in New Jersey

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December 2, 2009

Dr. Peter Oudemans
Dr. James Polashock
Marucci Center for Blueberry
and Cranberry Research and Extension
125a Lake Oswego Rd.
Chatsworth, NJ 08019

Dear Peter and Jim:

As I reach the end of the year, and try to tie up loose ends, I realized that I never sent you a formal thanks for your visit to Massachusetts to participate in our June 9th workshop on Fairy Ring Disease in cranberry. The information you presented on causal agent, field symptomology, diagnostic techniques (including how to sample) and management of this disease was extremely useful to the growers in attendance. Combining the bogside hands-on approach with the follow-up back at the lab with Q&A and the opportunity to look at the specimens they collected at the bog was an excellent way to help our growers understand this disease and its management.

Including the opportunity for participants to actually collect diagnostic samples as part of the workshop was a very effective technique. And yet you also included easy to follow explanations of how your molecular approaches had led to a better understanding of how the disease impacts the cranberry planting. This was a terrific example of how to bring the results of horticultural science to the end user. The feedback from the 25 growers in attendance was very positive. At least two growers present at our Crop Summit meeting yesterday noted very good success with the use of Indar with the recommended practice of running the sprinklers before and after the application. Other growers expressed an interest in how the new hybrid cultivars will fare with regards to the incidence of the disease in the coming years.

Thanks again for helping us to keep the Massachusetts cranberry growers educated about an important aspect of disease management.

Best regards,

Carolyn DeMoranville
Extension Assoc. Prof., Station Director

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