Cranberry Station Newsletter

FEBRUARY 23, 2016

UMass Cranberry Station
1 State Bog Road
P.O. Box 569
East Wareham, MA 02538

ag.umass.edu/cranberry

(508) 295-2212

UMass Pesticide Safety Training

TownePlace Suites Marriott, Wareham, MA
Tuesday - April 26, 2016, 8 AM - 12 NOON

$50 if signed up before 4/19/16, $60 if after, sign up on page 13
4 pesticide recertification credits offered

8:00 – 8:20	Chemigation and New Application Technology – John Mason, Slocum-Gibbs
8:20 – 8:50	The New WPS Requirements – Marty Sylvia
8:50 – 9:10	Frost, MRL Update, Zones Too – Carolyn DeMoranville
9:10 – 9:30	New Stuff on the Farm – Hilary Sandler
9:30 – 10:00	Pesticide Safety Review – Marty Sylvia
10:00 – 10:30	Coffee Break
10:30 – 10:50	Farm Safety and More – Hilary Sandler
10:50 – 11:10	Herbicide Spot Treatment: Poverty Grass, PI, and Dodder - Katie Ghantous
11:10 – 11:30	Fruit Rot Management – Erika Saalau Rojas
11:30 – 12:00	Insect Update, CFW WM and Scale, State of the Bees – Marty Sylvia, Anne Averill

November 2015 Oversight Committee Research Presentation Video Links:

https://www.youtube.com/watch?v=YjXVtMOTt8s

University of Massachusetts Amherst, College of Natural Sciences. United States Department of Agriculture cooperating. UMass Extension provides equal opportunity in programs and employment.

Plant Nutrition Program 2015

Dr. Carolyn DeMoranville
(program includes Krystal DeMoranville, research technician)

Reducing phosphorus (P) in cranberry waters.
Based on more than a decade of plot-scale and field-scale research, a recommendation not to exceed 20 lb/acre phosphorus (P) on established cranberry beds has been included in the Chart Book. We have been following a group of farms where P use has been reduced even further. These farms have been implementing P fertilizer reduction for more than 5 years (some for more than 10 years). In all cases, crop yield has remained steady or has increased. We collected samples from harvest floods at 5 farms and compared P concentrations in the water before P fertilizer reduction to those in 2013 and 2014. The pounds of P discharged in the floods *decreased* significantly after fertilizer P use was reduced. The table below shows the change in practice and the reduction in harvest flood P for these sites. For these sites, on average, approximately 3 pounds less P for each acre is released in harvest floods after fertilizer P has been reduced.

Site	# acres	Initial P rate (lb/a)	Reduced P rate (lb/a)	# years reduced	Reduction in P released in harvest flood (lb/site)	
1	26		5	7	71	72
2	47	29	7	7	59	17
3	63	20	9	12	187	216
4	45	24	8	9	185	146
5	15	22	9	6	110	103

In 2015, I undertook a major revision of the Nutrient Management section of the Chart Book to reflect these outcomes and provide guidance for reducing P fertilizer below 20 lb/a. I also worked with a team of scientists led by John Hart of Oregon State University, to revise the Nutrient Management Guide for Oregon Cranberries (https://ir.library.oregonstate.edu/xmlui/handle/1957/54896). Much of that information was used for the Chart Book revision.

Cranberry nitrogen budgets with focus on floods and rain events.
I am partnering with the Coalition for Buzzards Bay, and Marine Biological Laboratory to continue our studies of nitrogen budget. Starting with the 2015 harvest, we began the next phase during which we will more intensely monitor floods and large rain events to quantify the nitrogen budgets for cranberry. This expansion of the study is funded under a grant from MA CZM Southern New England Coastal Watershed Restoration Nutrient Management Grant Program.

CRANBERRY ENTOMOLOGY PROGRAM 2015

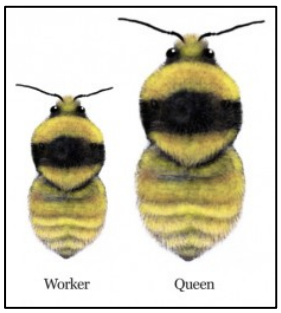
Anne L. Averill and Martha M. Sylvia

STUDIES ON THE HEALTH & CONSERVATION OF BEES IN CRANBERRY

(Funding: USDA, Hatch-Multistate, CCCGA, CI, OSC)

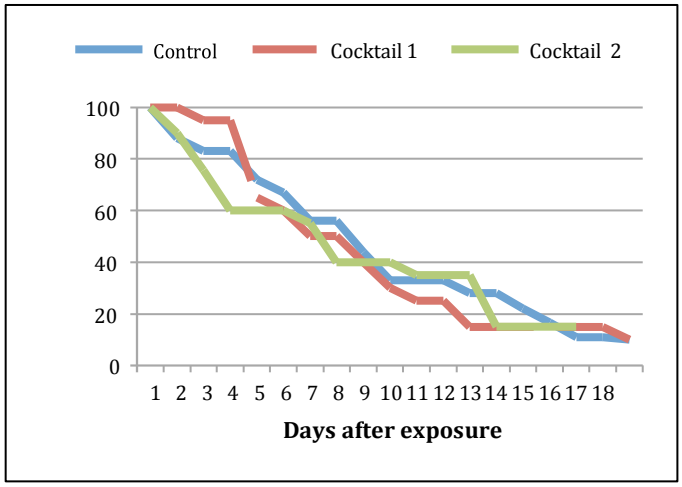
PROJECTS AND OUTCOMES

1. Bumble bee queen health survey: in spring, what pollens do they collect and what is their pathogen load? Several species of bumble bee are prolific on bogs and are the most important native pollinators in Massachusetts cranberry. The bumble bee colony cycle begins in spring, when queens collect pollen to establish new nests of workers. Thus, pollen availability in early spring is crucial. Wild queens from five species were collected; many queens had collected pollen from several sources and we are currently identifying the plant species. 57.4% of all queens had pathogens and or parasites, which we tentatively identified using microscopic analysis. Tissue has been sent to our UMASS cooperator for molecular confirmation. By far the most common bumble bee, *Bombus impatiens*, had significantly lower infection levels than the other species. Multiple infections within a single individual were most intense in *Bombus bimaculatus* and *Bombus perplexus,* both of which are in decline.



2. Are pesticide sprays applied at bloom safe for bees? Growers apply a mix of reportedly bee-safe pesticides at bloom; while they may be safe when used singly, they may not be safe when applied all at once or they may affect the exposed bee's physiology over time when applied sequentially. We applied compounds alone and/or standard fungicide/insecticide 'cocktails' to flowering vines in one test series, and in another test, made two applications a week apart. Treated vines were covered with large tents (shown at right below). Commercially-reared bumble bees were then allowed to pollen and nectar forage for 3 hours, at which point they were collected and observed in the lab until they died. Eight different trials were run and we report two below

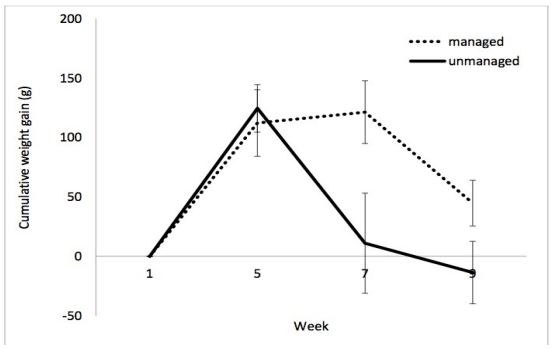
a. There was no 'cocktail effect;" survivorship of bees was similar in control plots and for plots where 2 different mixes of newly-introduced bee-safe fungicides and insecticides had been applied (Indar/Abound/Altacor and Indar/Abound/Intrepid) (shown below).



b. When bees were exposed twice, a week apart, there appeared to be an effect, which we must follow up in 2016. Bees were first exposed to old chemistry fungicides (Bravo, Manzate), then held in the lab, and then exposed to new chemistry cocktails (Indar/Abound/Altacor). Here, bee

survivorship patterns over the following weeks appeared significantly different from the control. Both of these old chemistry fungicides have been implicated in aspects of bee health in other crops.

3. Are bumble bee colony growth and fitness similar in commercial cranberry bogs and conservation (unmanaged) sites? In sum: yes, they were quite similar, and for some measures, commercial beds supported superior growth, suggesting that commercial cranberry beds are suitable for supporting wild bumble bee populations. Methods: prior to bloom, 72 commercially- reared bumble bee colonies (shown below, left) were deployed at 4 pairs of managed cranberry bogs and unmanaged conservation sites (very large cranberry bogs taken out of production years ago). Colony weights were assessed at points over two months (shown below right): after five weeks, mean colony weights/site between the two habitat types were similar, after seven weeks, it had dropped at the unmanaged sites (presumably because of greater pollen availability at mass- blooming commercial sites) and finally, at nine weeks, weights were statistically similar.

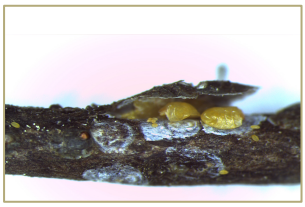


After nine weeks, we counted the mean number of queens, males, workers, and pollen pots. Only worker number and pollen number were significantly higher in the managed bogs when compared to the unmanaged conservation sites.

	Habitat type	
	Managed	**Conservation (unmanaged)**
Queen number	8.1	6.7
Mean queen weight (g)	4.3	3.6
Queen cell number	20.0	20.7
Male number	10.0	8.9
Worker number	90.1	61.4 *
Pollen pot number	9.4	5.1 *

CRANBERRY SCALE OUTBREAK

(Funding: CCCGA, CI, OSC)



For a second year, reports of dead vines across the MA cranberry-growing region were common. Over a four-month period, starting in April, we visited 22 sites and assessed presence of two damaging species of Diaspididae-armored scale. Thousands of vines were examined for scale under the microscope. New diagnosis of scale was made at 11 sites: ten were Putnam scale (*Diaspidiotus ancylus*) and one was Dearness scale (*Rhizaspidiotus dearnessi*). Sites were monitored to determine when the susceptible crawler stage appeared for best timing of treatment. A screening trial of five biological or low-impact options showed that none was effective, in comparison to conventional organophosphates.

Plant Pathology Update

Erika Saalau Rojas

A year without Bravo

Last year, the European Union revised the chlorothalonil (Bravo) Maximum Residue Level (MRL) allowed on cranberries from 2ppm to 0.01ppm.

This change essentially eliminated the use of Bravo on export-certified fruit, leaving growers with very few fungicide alternatives to control fruit rot this growing season.

Field research. In light of this change, 2015 growing season field trials focused on:

i. Testing new chemical products effective against fruit rot
ii. Evaluation the efficacy of fungicide regimes
iii. Improving the timing of fungicide applications.

The main goal of these trials was to develop fungicide recommendations that effectively control fruit rot, prevent the development of fungicide resistance, and reduce pesticide residues risk on fruit.

Fungicide resistance. Reduced fungicide sensitivity to Bravo alternatives has already been reported in several cranberry fruit rot pathogens in MA; however, there is not a fungicide resistance-monitoring program established in our state. In 2014, 60 fungal isolates were collected from high-risk bogs and from these, approximately 40 isolates were screened for reduced sensitivity to Abound, one of the single-site mode of action fungicides used to control fruit rot.

Briefly, isolates were exposed to different fungicide concentrations in vitro and reduced sensitivity was determined by comparing growth rates with and without exposure to the fungicide.

Ten fungal isolates from different locations exhibited reduced fungicide sensitivity to Abound, highlighting the importance of monitoring pathogen populations and developing fruit rot management approaches that incorporate fungicide resistance guidelines.

Other season highlights

Cranberry stem gall, a sporadic bacterial disease, was detected in several MA locations. Symptoms include shoot dieback and numerous galls on older woody tissue of affected vines. The disease is believed to be associated with plant stress (e.g., winter injury) and mechanical damage associated with equipment and harvest practices.

Blueberry stunt, a disease caused by a phytoplasma, was detected in one bog in MA. Symptoms included shortened internodes and leaf cupping, giving infected plants a bushy appearance. This pathogen has only been reported in blueberry and it is spread by sharpnosed leafhoppers and via plant cuttings. Since there are no previous reports of this disease on cranberry, we know very little about the transmission and potential impact of this disease.

CRANBERRY FRUIT ROT WORKING GROUP

Members of the Cranberry Fruit Rot Working Group met during the NACREW conference held in August 2015, in Bandon, Oregon. The main goal of this meeting was to discuss research ideas that would help the cranberry industry cope with short- and long-term fruit rot (and other cranberry diseases) management challenges.

We gathered input from industry, extension specialists and researchers, representing most, if not all cranberry-growing regions. At the end of the discussion we created 2 valuable products:

We gathered input from industry, extension specialists and researchers, representing most, if not all cranberry-growing regions. At the end of the discussion we created 2 valuable products:

1) A list of the most important cranberry diseases by region
2) A national documents listing needs and research priorities that could help coordinate and direct all research efforts towards the development of new and improved fruit rot management strategies.

NEEDS AND RESEARCH PRIORITIES

Fruit Quality Identify pre-harvest factors that affect fruit firmness Re-examine and test storage quality forecast models Harvesting technology for improving quality Pre-harvest parameters that affect quality Storage quality prior to freezing and impact on SOC Investigate physiological breakdown **Biology of fruit rot fungi** Understand life cycles of individual fruit rot fungi Timing of infection and biology of fungi Develop and apply identification methods Monitor development of fungicide resistance Incorporate weather data into study of disease cycles **Infrastructure** Database to share regional research results Shared electronic communication and media Coordinated registration of chemical products	**High**
Improving chemical control efficacy Screen efficacy of new fungicides and programs Emphasize on testing novel modes of action Research and discover biological control methods Investigate impact of fungicides on fruit quality Develop new application methods Evaluate existing application systems Delivery methods for fungicide applications **Cultural control practices** Canopy management to reduce heat stress on fruit Optimize irrigation for cooling to reduce fruit rot Cultural practices to reduce inoculum pressure Impact of sanding and pruning practices on fruit rot **Plant resistance** Develop methods for evaluating host resistance Genomic approaches for resistance breeding	**Medium**
Climate Change Develop models to predict fruit rot by region Study extreme weather events	**Low**

Selected Highlights of the 2015 Cranberry IPM/Weed Program

Dr. Hilary Sandler and Dr. Katherine Ghantous with support from
N. Demoranville and K. DeMoranville

Research Highlights:

Advances in dodder management. Dodder continues to be one of the most problematic weeds for Massachusetts cranberry growers. Several projects this year focused on improving the efficacy of Casoron, the primary herbicide used for preemergence dodder control. These studies ranged from examining the effectiveness of irrigating for 1 to 2 hours after herbicide application to incorporate the chemical into the soil, to studying the effects of sanding prior to Casoron application, to field trials with increasing rates of Casoron. We also screened six herbicides for use as a preemergence dodder control, and two as a postemergence control. One pre- and one postemergence herbicide were identified as potential candidates for cranberry use, and further testing will be conducted next season.

Management Tools for Poverty Grass. Poverty grass (Broomsedge bluestem (*Andropogon virginicus*) and Little bluestem (*Schizachyrium scoparium*) has emerged over recent years as serious weed problem in Massachusetts cranberry. Six herbicides were screened for use as a preemergence control, and two as a postemergence control. Three of the preemergence herbicides showed activity against both species, and future testing will be conducted. We also completed a Fact Sheet to inform growers of basic poverty grass biology and management recommendations with currently available tools.

Extension Highlights:

- We published a 293-page **Cranberry Weed Identification Guide** that was translated from French. The guide unites high-quality photographs (nearly 1,000) with descriptions for 144 weeds commonly found throughout cranberry production areas. The weeds were given Priority Ratings that gauge the impact of each weed as well as its potential to colonize and reproduce. Workshops on weed ID were given in Maine and Massachusetts with another planned for New Jersey in January 2016.

- Due to the difficulty of registering new herbicides for use in cranberry, we are trying to broaden the use pattern of herbicides that are currently available. We obtained a **Special Local Needs** (SLN or 24c) for concentrated spot applications of **Callisto** for dodder and poison ivy control. This label also included language to permit lower use of surfactants during chemigation of Callisto, improving spray application and reducing costs. We also obtained a **FIFRA 2ee** (variation in application not prohibited on the label) to reduce the application time of **QuinStar** to less than 30 minutes if experience indicates application uniformity is not compromised.

- **Extension Implementation Grant (EIP)**. We worked with two cranberry growers who are diversifying crops grown on their farms. We provided scouting, diagnosis, and recommendations for raspberries (with Sonia Schloemann, UMass Extension) and vegetable support (with Katie Campbell-Nelson, UMass-Extension). We provided weed management support for organic production of Scarlet Knight cranberries.

- **Scholarworks** (a digital library) remains an important outlet for the Extension work at the Station. For the period of Sept 2014-Aug 2015 we had 1,036 downloads of various Chart Book files, 371 copies of the Cranberry Production CP-08 (Executive Summary and Full) Manuals (+48% from last year), 678 copies of BMPs (-38% from last year; IPM was downloaded most frequently, 215 times), 2,154 copies of our Extension PowerPoint presentations (-14% from last year; pesticide compatibility chart was the most popular with 200 downloads), and 331 fact sheets (physiology of cranberry yield was the most popular with 110 hits).
- The **UMass Cranberry Web site** tallied 11,915 users between October 1, 2014-September 30, 2015 (+123% from last year when we reported 5,340 users). We had 35, 376 page views with 27,132 unique page views on the site (17,692 entrances onto the site) during that time. Visitors spent an average of 1:32 minutes on the site (28 seconds less than last year). The top 5 visited pages were "How Cranberries Grow", Weather, Personnel, Chart Book, and IPM message alerts. Most users (90%) were from the U.S. but visitors were also from UK (2.3%), other English-speaking areas (1.1%) and several hundred people from France, Poland, Spain, Canada, and Germany. Most users accessed the site via desktop computers (66%) but 22% used mobile devices (up from 15% last year) and 11% used tablets (up from 9% from last year).

Other Program Highlights:

- Our lab published 1 refereed article (flame cultivation and control of soft rush) and 5 abstracts. M. Tjiurutue (PhD student in Plant Biology) has 1 refereed article in press on response of cranberry varieties to dodder due to induced chemical defenses.
- Worked with a grower that has widespread dodder problems on his farm to test different rates of Casoron applied as either a single treatment or split into two separate applications separated by 2 weeks.
- Conducted a greenhouse experiment studying whether dodder seed collected from different sites had differing sensitivity to Casoron during germination.
- Conducted 5th year of treatments for studying the long-term effects of delayed applications of Casoron on four cranberry varieties.
- Provided the **Town of Barnstable Conservation Commission** with cranberry crop safety information for an aquatic herbicide that will be applied to a freshwater body whose waters are accessed by cranberry growers.
- Produced **facts sheets** on Poverty Grass management and Backpack Sprayer Calibration.
- In collaboration with Cornell University, we are offering a "Train the Trainer" webinar series on **Pesticide Resistance Management** for Extension personnel throughout New England and the Mid-Atlantic (starts end of November 2015). NE-SARE Grant: $91,500.
- Sandler administrates EIP grant program for UMass Extension small fruit, tree fruit, vegetables, and cranberry teams. Year 1 (of 3-year grant) monies from USDA-NIFA: $194,000.
- Industry support for applied research in weed management. CI/CRF/OSC: $19,500.

Plant Physiology Research Agenda 2015: Peter Jeranyama

1. **Irrigation water management and Tile drainage**. The objectives of this research project are- to (i) develop a Crop Water Stress Index (CSWI) using soil moisture monitoring devices such as tensiometers, moisture sensors along side water level floats, and (ii) develop a relationship between matric tension and volumetric water content. Traditionally, cranberry beds received 1 inch of water per week from either rain, capillary action from the groundwater, irrigation or some combination of these. These objectives have been tested over 4 years and we have to come to the conclusion that the zone of saturation (when to stop irrigation) in cranberry bogs is reached at a tension of -2kPa (2 cbar) or volumetric water content (VWC) of 30-36%, while field capacity (when irrigation should be initiated) occurs at a tension of -5kPa or 10% VWC in sand; and -4.5kPa or 15% VWC in peat bogs. Going by the 1-inch water a week rule might result in over watering. The tile drainage multidisciplinary project is developing information on drain spacing and depth installation while evaluating plant responses, hydrological behavior, and the impact of various drainage installations on incidence of plant diseases (especially Phytophthora sp.) and weeds associated with poorly drained cranberry soils (especially yellow loosestrife).

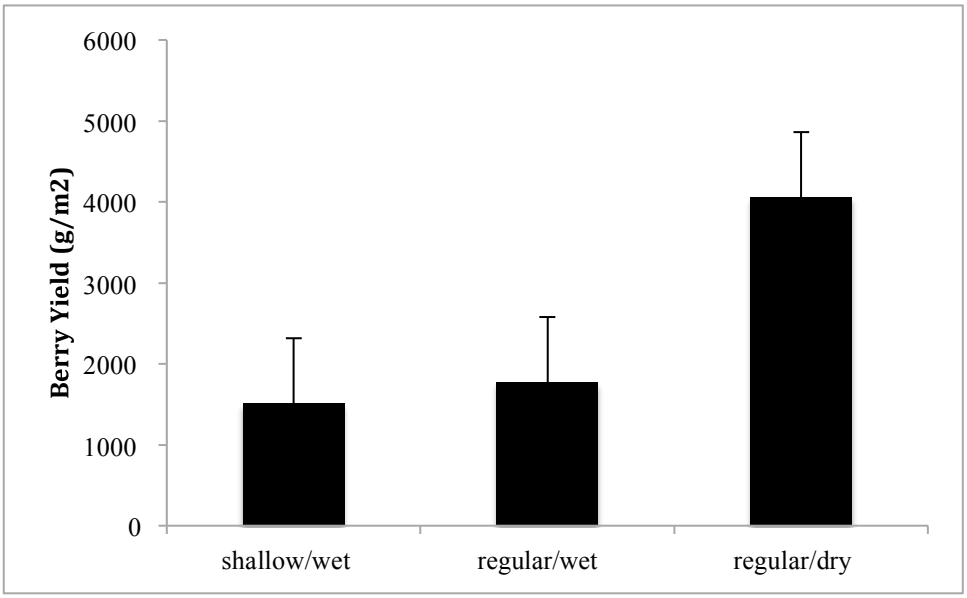


Fig 1. Yield differences between cranberry beds (Middleboro, MA) managed as either dry (tension>4.5 cbars) or wet (tension <2 cbars) with tile drains installed at shallow (<8 inches) and standard or regular (12 inch) depths.

2. **Automated irrigation cycling in cranberry frost protection**: The objectives of this project are to (i) demonstrate the efficacy of automated irrigation cycling for cranberry frost protection by evaluating cranberry buds for frost damage following frost events with cycling implemented (ii) determine the effective set points for automated frost cycling by evaluating several options selected from grower experience and the literature on the science of frost protection, (iii) quantify the amount of water applied and fuel used during the evaluated cycling protocols for both mild and severe frost events and compare to water use in a non-cycled protocol, (iv) field test various sensors and compare temperature measurements of the bud/canopy and (v)synthesize the information gathered and develop BMP guidance for the use of automated irrigation cycling in cranberry frost protection.

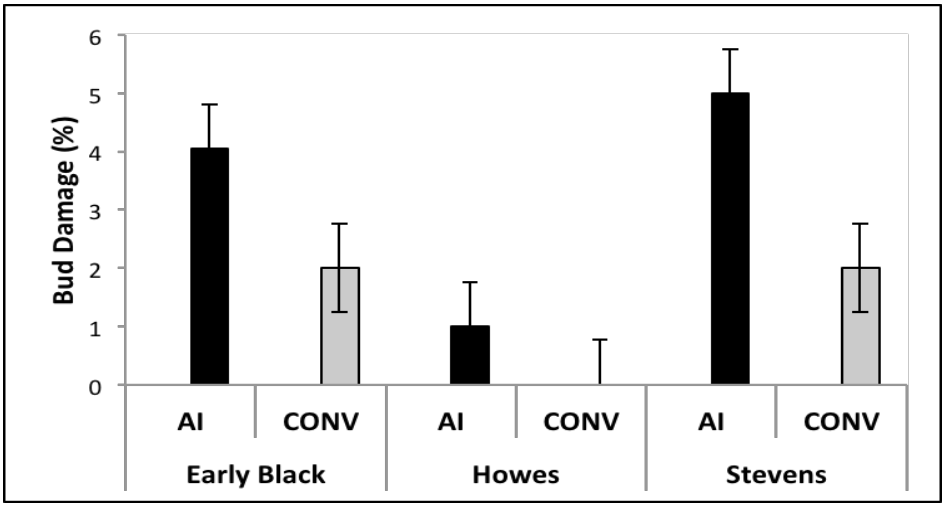


Fig. 2. Cranberry bud damage evaluated at the end of the 2013 season, as a percentage. AI=automated intermittent, CONV=conventional/continuous

Table. 1. Effects of frost protection methods on the average yield of three cranberry cultivars 'Early Black', 'Howes' and 'Stevens' under conventional and cycling frost protection methods for one site in Carver, MA in 2013 and 2014

	2013			2014		
	Method			Method		
Cultivar	INT	CON		INT	CON	
	----------bbl/acre----------		Contrasts	----------bbl/acre----------		Contrasts
Early Black	306a	192b	*	235a	210b	NS
Howes	355a	309ab	NS	461a	380a	NS
Stevens	339a	338a	NS	595a	480a	NS

†Means followed by the same letter(s) within a column are not significantly different, based on Fisher's protected LSD ($\alpha = 0.05$). Method contrasts show the method effect on cultivar performance through assessments of each cultivar under both methods. NS, Nonsignificant at $p = 0.05$

3. **Cold Acclimation**. Cranberries undergo several physiological changes during acclimation including the synthesis of carbohydrates and lipids that enable them to tolerate low temperatures in winter but cultivars respond differently to cold acclimation. Our objectives were to evaluate the response of four cranberry cultivars to different temperature regimes during cold acclimation, quantify lipids and carbohydrates synthesized at these different temperature regimes, and determine LT50 (damage index). The acquisition of cold hardiness of six cultivars in the field was likely slowed down by the harvest flood, which was applied on 1 Oct. and removed on 7 Oct. 2014. During that period, the uprights were submerged under 60 to 64˚F water. We did not observe any progression in cold hardiness for any cultivar during the flood period. Workmaster and Palta (2006) showed a temporary loss of hardiness in 'Stevens' during a harvest flood in WI, while in our study the progression was only arrested. Most of the cultivars recovered by the sampling one week after the flood, continuing to progress to lower hardiness temperatures. However 'Crimson Queen' and 'Demoranville' remained at the arrested temperature for longer than the rest of the cultivars.

Note: Items 2 and 3 included the Ph.D. project of Dr. Faith Ndlovu.

2016 PESTICIDE APPLICATOR LICENSE TRAINING WORKSHOP

Held at the UMass Cranberry Station Library
Tuesdays: April 5th and 12th, 2016
For more information and registration form:
http://www.umass.edu/pested/training_workshops/

or contact: Natalia Clifton at 413-545-1044
Sponsored by Pesticide Education,
UMass Extension Agriculture and Landscape Program

WORKER PROTECTION STANDARD HANDLER TRAININGS

Worker Protection Training for cranberry workers in the handler category for Spring 2016 will be held at the CRANBERRY STATION LIBRARY, 2-4 PM on the following Wednesdays: March 30th, April 27th, May 25th, and June 29th.

There is a $5 fee to cover the cost of the WPS training manual. If you have a pesticide license, you do not need this training. If you have workers, they do need this training! Contact Martha Sylvia: 508-295-2212, ext. 20 to sign up or for additional information.

Carolyn DeMoranville, Station Director

Your Help is Needed

Please participate in an important research study conducted by Professors Brian Gareau (Sociology) and Tara Pisani Gareau (Environmental Studies) of Boston College in collaboration with the UMass Cranberry Station.

We ask you to complete a short survey that asks about several environmental pressures (such as weather, pests and diseases, and water availability) and various social conditions that have been important to you as a cranberry grower.

Your knowledge of cranberry farming is valuable information for their research on the state of the industry and its history in New England. A link to the survey can be found here

Or, you can cut and paste this link to your web browser:
http://goo.gl/forms/48zypJKPas

For any questions, please contact Brian Gareau at: gareau@bc.edu

Thank you,

Carolyn DeMoranville
Station Director

The Cranberry Station website has been updated. Revise your bookmarks and check it out at:

http://ag.umass.edu/cranberry

For information on Nutrient Management Planning – follow the QUICK LINK on the right side of the home page

There is also a QUICK LINK to presentations from past extension meetings

Registration Form for UMass Pesticide Safety Training
Tuesday - April 26, 2016, 8:00 AM - 12:00 PM
TownePlace Suites Marriott, Wareham, MA

Please register for the meeting using this form. **(PLEASE PRINT)**

COMPANY NAME _____

COMPANY CONTACT PERSON _____

EMAIL _____

PHONE _____

NUMBER OF ATTENDEES _____

NAMES OF ALL ATTENDEES:

_____ _____

_____ _____

_____ _____

Return with payment by:
April 19, 2016
Include check made out to:
UMass
In the amount of:
$50.00 PER PERSON
IF POSTMARKED BY **4/19/16**

After that date, registration increases to
$60.00 per person

Return to:
UMass Cranberry Station
P.O. Box 569
East Wareham, MA 02538

**** All persons attending the meeting must register and pay, regardless if receiving pesticide credits or not. ****

Got Raccoons?

USDA Wildlife Services is currently in the process of preparing for the distribution of oral rabies vaccination baits throughout Plymouth County for the first time since 2003. Therefore, they are actively seeking landowner permissions to place cage traps in Spring of 2016. For more information, please contact Brian Bjorklund at (413) 537-9394 or at brian.bjorklund@usda.gov.

UMASS Pesticide Safety Training

Tuesday - April 26, 2016, 8 AM – 12 Noon, $50

4 pesticide recertification credits offered

Sign up on page 13

NEW VENUE!!
TownePlace Suites Marriott, Wareham, MA

See front page for details

UMASS EXTENSION
UNIVERSITY OF MASSACHUSETTS
P.O. BOX 569
EAST WAREHAM, MA 02538

OFFICIAL BUSINESS