

# Abstracts of the ASHS Northeast Region Annual Meeting

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## Graduate Paper Session: Wednesday, 6 Jan. 2010

### Single or Split Application of Gypsum Increases Leaf Nutrient Levels of Wild Blueberry (*Vaccinium angustifolium* Ait.)

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Gypsum applied as a single application (4482 kg/ha) or a split application (2 x 2242 kg/ha) was evaluated at two commercial blueberry fields for its effect on soil nutrient release and nutrient uptake. Gypsum application was compared to DAP (448 kg/ha) and a control. Gypsum and DAP were applied to 0.9 m x 15 m plots arranged in a RCB design with 6 blocks. Composite leaf and soil samples were collected in July 2009 and analyzed for nutrient concentrations. Gypsum raised soil Ca and S concentrations compared to DAP and the control. One of the fields was deficient in leaf N and P. Only at the deficient field, both gypsum treatments increased leaf N and P, compared to the control. Application of DAP increased leaf N and P in both fields. A split application was not more effective than a single application of gypsum for raising leaf N and P concentrations.

### Variability in Carotenoid Content and Profiles of Winter Squash Cultigens

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*Cucurbita moschata* and *Cucurbita maxima* winter squash are considered excellent sources of carotenoids, the fat-soluble pigments. Among the most nutritionally important carotenoids found in plants, beta-carotene is an important precursor to vitamin A, and lutein, and zeaxanthin are the two principal pigments in the macular region of the retina. An extensive survey of winter squash cultivars and breeding lines was conducted to determine the carotenoid content and profiles of winter squash harvested at four time periods: 40 days post-anthesis (DAP), 60 DAP (approximate mature harvest), 60 DAP + 30 day storage at 14 °C, and 60 DAP + 60 day storage. Total carotenoid content was determined using spectrophotometric analysis of mesocarp tissue of six *C. maxima* inbred lines, four *C. maxima* hybrids, two *C. moschata* open pollinated cultivars, and five *C. moschata* inbred lines. Overall, spectrophotometric analysis correlated well with visual observations using a DSM-Yolk Color Fan developed for estimating carotenoids in egg yolks, and confirmed visual selection for high carotenoid content in breeding lines. Using HPLC analysis we have examined carotenoid profiles in several cultigens. Waltham, a widely grown butternut cultivar of *C. moschata* had the following average percentage composition of carotenoids at 60-day harvest: 21% beta-carotene, 13% alpha-carotene, 32% lutein, and 34% other, mostly esterified, not yet identified carotenoids. Comparing carotenoid profiles among three breeding lines of *C. moschata*, NH421 had over 50% beta-carotene and less than 20% lutein, NH851 had a carotenoid profile similar to Waltham, but with higher proportions of beta-carotene (28%) and lutein (38%), and NH910 had 30% beta-carotene and 26% lutein. The carotenoid profiles of four *C. maxima* hybrids, three of which had green skin and one orange skin, were fairly similar. The proportion of beta-carotene was relatively low (12% to 19%) in all four hybrids, and the proportion lutein ranged from 19% to 25%. Zeaxanthin, a carotenoid not observed in *C. moschata*, comprised between 5% to 11% of the total. Variability in carotenoid content and profiles among breeding lines suggest that the nutrition of squash varieties can be markedly improved using traditional breeding strategies.

### Growing Winter Sprouting Broccoli in New England

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Winter sprouting broccoli, a popular spring-harvested vegetable in England (UK), was grown successfully at the University of New Hampshire (UNH) Woodman Farm, Durham, NH. We evaluated the effects of rowcover on yield of purple- and white-sprouting winter broccoli cultivars in unheated polyethylene high tunnels (high tunnels). Yield of all winter sprouting broccoli cultivars was improved by use of rowcover during the 2007-2008 and 2008-2009 growing seasons. The 2008-2009 season included 11 varieties of winter sprouting broccoli in a cultivar trial under rowcover to measure yield. A significant difference in yield was present only between the greatest and least yielding cultivars of the cultivar yield trial. Average yields ranged from 1.4 kg/m<sup>2</sup> to 0.6 kg/m<sup>2</sup>. Widespread plant mortality was recorded in all cultivars without rowcover and only minor plant mortality was recorded on covered plants in the rowcover trial. Temperature measurements collected during 2008-2009 season recorded a low temperature of -28 °C (-18 °F) outdoor ambient air on 16 Jan. 2009. Concurrently, the low temperature inside a 9.1m by 18.2m (30 ft x 60 ft) high tunnel reached a low of -17 °C (2 °F) and the low temperature under rowcover in the high tunnel was -12 °C (11 °F).

### Reducing Tillage in an Organic Vegetable System: In-row Weed Control and Fertility Management

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Organic systems depend on intensive tillage for weed management, yet interest in conservation tillage methods is expanding in response to concerns regarding soil quality and environmental health. Deep zone tillage is one method that minimizes the width of soil disturbance to the planting row while providing sufficient soil disturbance to increase drainage and aeration and decrease compaction. This research addresses two constraints to an organic vegetable reduced tillage system: in-row weed control and fertility management. Two cover crop mixes, hairy vetch-rye or oats-peas were sown on two different dates at two different rates. Oat-pea cover crops were winter killed and hairy vetch-rye plots were fall mowed. Plots were then deep zone tilled, without incorporating cover crop biomass. Peppers were transplanted, and cover crop mulch in half of the hairy vetch-rye plots was raked in-row to concentrate the biomass. All plots required cultivation and hand-weeding, which was timed. Weed counts and biomass, pepper plant and fruit size, soil temperature, and soil N were monitored over the season. Planting cover crop earlier in the fall increased cover crop biomass the following spring but increasing cover crop seeding rates did not increase cover crop biomass. In-row mulch decreased weed biomass and pepper plant size but did not affect marketable fruit yields.

### Natural Resource and Cutting Propagation of *Ilex suaveolens* (Levl.) Loes.

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*Ilex suaveolens* (Levl.) Loes., a member of Aquifoliaceae, is an evergreen tree with a mature height of 7-15 m. It is an endemic species in China and can grow well in various habitats. The market demand is

high for its ornamental features, such as pyramid shape, brilliant red fruit, and angular and glabrous young stems. To introduce this wild plant for cultivation, softwood cuttings were collected in Mar. 2008 and treated with KIBA and KNAA at 1000, 3000, or 8000 ppm. Compared with control (no hormones), rooting hormones significantly induced root formation. The highest rooting percentage, 62.5%, was obtained under the KIBA at 1000 ppm. As rooting hormone concentration increased, the rooting percentage of *Ilex suaveolens* treated with KIBA decreased from 62.5% to 18.8%, while that with KNAA increased from 50% to 56.3%. In terms of root quality, cuttings treated with KNAA produced better roots. The biggest root ball volume, 168.4 cm<sup>3</sup>, was observed on cuttings treated with KNAA at 8000 ppm. Cuttings treated with KIBA had root-ball volumes of 38.8.2-77.4 cm<sup>3</sup>, while those with KNAA were over 93.7 cm<sup>3</sup>. For the propagation of *Ilex suaveolens*, softwood cuttings treated with KNAA at 8000 ppm were recommended.

### **Cold Hardiness of *Ilex glabra* Cultivars from Field Trial and Laboratory Test**

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*Ilex glabra* (L.) A.Gray (inkberry), a native evergreen shrub with dark green foliage and compact habit, has gained popularity in the northern landscapes of the United States. To determine the cold hardiness of inkberry cultivars and provide cold-hardiness data for growers as references for production and marketing, a field trial of 13 inkberry cultivars was established on 30 June 2008. A laboratory test of 11 inkberry cultivars was also conducted on 15 Jan. 2009. Plant survival was 93% in May 2009. *Ilex glabra* f. *leucocarpa*, 'Nigra', and 'Viridis' were the least cold-hardy cultivars; while inkberry wild species and its cultivars including 'Chamzin', 'Compacta', 'Densa', 'Nova Scotia', 'Pretty Boy', 'Pretty Girl', and 'Shamrock' were the most cold-hardy cultivars. Based on laboratory test of inkberry cultivars, the temperature that results in 50% relative electrical conductivity (REC<sub>50</sub>) of 'Nigra' was -18 °C; while that of 'Viridis', 'Pretty Boy', and *Ilex glabra* f. *leucocarpa* ranged from -25 °C to -30 °C; and 'Pretty Girl', 'Shamrock', 'Densa', 'Nova Scotia', and 'Chamzin' over -31 °C. The cold hardiness rating from field trial was significantly correlated with the REC<sub>50</sub> value from laboratory test. Our results suggested that both data from field trial and laboratory test were reliable for the measurement of inkberry cold hardiness. Results from laboratory test could be used to predict the cold hardiness of inkberry cultivars. The factors, including plant cultivar, plant size, temperate, snow pack, mechanical injury, deacclimation, winter desiccation, and photoinhibition) should be in consideration.

## **Oral Session I: Wednesday, 6 Jan. 2010**

### **Jersey Fresh Survey Results for Direct Marketing of Produce in Middlesex County, NJ, 2009**

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Surveys on consumer preferences for local agricultural commodities, sold as direct marketed "Jersey Fresh" products, were conducted at the Middlesex County Fair and EARTH Center Open House in Aug. 2008 and 2009. Surveys provided information on consumer knowledge and preferences on produce purchases. A *t*-test was done on two of the survey questions. The statistical analysis of the surveys indicated that a significant amount of participants believe that direct farm market produce is of higher quality than large box store produce. The responses from 2008 and 2009 were statistically the same. The statistical analysis also revealed that a significant amount of participants believe organic produce is healthier than conventional produce. Responses from the

two years was statistically different, in 2009 fewer reported that they believed organic produce was healthier. Consumers were also asked to provide information on what type of products they would like to see at farm stands and how farmers can effectively advertise the availability of their produce. A few questions covered individual purchasing preferences including: type of produce, locality and convenience. The convenience of produce availability and knowledge of market locations are the most notable factors. An effort was made to advertise the health benefits of consuming fruits and vegetables and promote "Jersey Fresh" with the aid of brochures. Further effort was made to inform residents of local farm markets and stands throughout Middlesex County. Participants were provided with samples of local "Jersey Fresh" products including sweet corn, tomatoes, peaches, and watermelon.

### **Growth and Physiological Responses of *Camellia oleifera* Abel Cultivars to Controlled Drought**

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The establishment of newly planted tea oil seedlings is sensitive to the environmental stress. To better understand effect of drought, morphological and ecophysiological responses of *Camellia oleifera* Abel 'Winter Snowman' and 'Lu Shan Snow' under controlled irrigation levels at 0.11, 0.22, 0.33, or 0.45 m<sup>3</sup>·m<sup>-3</sup> volumetric water content (VWC) were investigated from July to Dec. 2009. Irrigation level at 0.11 was too low to provide enough water for plant growth and mortality was 75% and 100% for 'Winter Snowman' and 'Lu Shan Snow', respectively. For the other treatments, 'Winter Snowman' was more drought tolerant than 'Lu Shan Snow'. Chlorophyll fluorescence value (Fv/Fm), plant height, the number of branches and leaves of 'Lu Shan Snow' grown at 0.33 or 0.45 m<sup>3</sup>·m<sup>-3</sup> VWC were significantly higher than that of 0.22 m<sup>3</sup>·m<sup>-3</sup> VWC and the highest values were 0.72, 17.50 cm, 2.63 and 27.63, respectively. For 'Winter Snowman', the above parameters increased with increasing VWC and the highest values were 0.72, 31.50 cm, 4.38 and 60.38, respectively. Regardless of treatments, the plant height and number of leaves of 'Winter Snowman' were significantly greater than that of 'Lu Shan Snow'. Fv/Fm value, plant height, the number of branches and leaves had significant positive linear correlations with irrigation levels. Allometric analysis suggested that plants tended to grow more root tissue when VWC at lower levels and the root/shoot ratios were 0.82, 0.68, 0.58, 0.62, and 0.53 for VWC at 0.11, 0.22, 0.33, 0.45, and control. Relative leaf water content (RWC) and leaf size of both cultivars had no significance among all the treatments. We suggest that an optimum range of VWC for growing tea oil should be above 0.33 m<sup>3</sup>·m<sup>-3</sup>.

### **The Rutgers Master Gardener Program: 25 Years of Outreach and Education**

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Since 1984, nearly 6,000 New Jersey residents have been trained, certified, and volunteered as Rutgers Master Gardeners. The program has grown substantially over the past 25 years, with approximately 3,000 active Rutgers Master Gardener volunteers in 18 of 21 county programs creating, delivering and enhancing many community-based programs related to gardening, horticulture, and environmental well-being. County programs annually train approximately 360 residents seeking to attain Rutgers Master Gardener certification. Native landscapes, community gardening for low-income audiences or densely populated areas, the Garden Helpline, horticultural therapy and support projects, speaker bureaus, schoolyard gardens and habitats, and public health and safety projects are just a few examples of outreach efforts supported through this trained volunteer corps. This program, which has greatly expanded the mission and efforts of Rutgers Cooperative Extension, is second only to the 4-H Youth Development program in visibility and public relations for both the University and county offices. Over the past

25 years, more than 1.3 million hours of service with value of approximately \$21.5 million dollars have been realized through the Rutgers Master Gardener program. Surveys (n=763) reveal that these volunteers were previously employed in education (23.3%), medical and health care (21.6%), business and finance (14.5%), office and administrative support (13.2%), and sales (11.7%). A separate program survey (n=568) revealed a majority of Rutgers Master Gardener volunteers (61.4%) remained active in their first five years following the class, initial certification, and annual recertification requirements, while only 23.8% remained active from five to ten years post training. The trend continued, with only 4.9% volunteering for ten to fifteen years, and 3.7% remaining active 15-20 years as a Rutgers Master Gardener volunteer. These findings should assist land grant universities delivering the Master Gardener program in reporting outcomes and impact, identifying sources of potential volunteers, and providing resources to support volunteer management within local Master Gardener programs.

### **Encouraging Water Conservation and Environmental Stewardship: Eco-Ventures at the EARTH Center**

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"Eco-Ventures" is a 5-day environmental program for youth entering grades 5 through 8. Throughout the program, youth participate in educational activities and discussions concerning environmental awareness and stewardship, and energy conservation. Some activities, such as water quality analysis and pond mapping, focused on the importance of maintaining a chemical balance in water sources and reducing pollution at its source. Other activities, including a pond exploration focused on collecting and identifying different aquatic insect species and then discussing the importance of their presence. This activity focused on ecosystem health and diversity. Throughout the week the youth worked in teams on PowerPoint® presentations to share what they had learned about various native and invasive plant species and how they determine the health of a pond ecosystem. During the last two days of the program, youth worked in teams to develop and film public service announcements, in order to promote environmental awareness within their own communities. Youth were given pre- and post-tests to evaluate the effectiveness of the activities in increasing their knowledge of subject matter. Most of the questions showed greater than 50% increase in knowledge by the end of the week. A *t*-test was done on the pre- and post- test results. This test confirmed that there was a statistically significant, ( $P > 0.001$ ), increase in the knowledge gained by youth. Youths also developed short-term (1-2 months) and long-term goals (6 months or greater), toward environmental conservation at home and in their communities. Progress is recorded through a 3-month follow-up phone survey.

### **Chlorination Systems to Control *Escherichia Coli* in Irrigation Water**

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*Escherichia coli* above acceptable levels (126 cfu/100 mL) have been observed in some surface New Jersey irrigation water. The frequency and level of the *E. coli* depends on environmental conditions, which makes it difficult for growers to know when to stop using the water source. To control *E. coli* growers need a reliable and cost effective method. Evaluation of a control system for *E. coli* was the objective of this study. A PPG Industries tablet chlorination system (calcium

hypochlorite) was attached at the intake irrigation line to inject chlorine on a continual basis. Dry tablets 3 inches in diameter were placed in a PCV container and water flowed over the bottom of the tablets releasing chlorine into the system. Water samples were collected from 30 June to 2 Sept. 2009 (10 sampling dates) from three locations (pond, injection filter and at the end of a drip line) at the site. Water was collected in sterile 100-mL containers then analyzed in a commercial laboratory using the EPA 1603 method for generic *E. coli*. The goal was to maintain free chlorine levels at the pump at 4-5.0 ppm and 2.0 ppm at the end of the drip line. Chlorine levels were monitored from 1 July to 2 Sept. Over the 10 sampling dates, *E. coli* levels were above 126 MPN/100 ml for five dates from 27 July to 2 Sept. Chlorine at the intake registered 4 ppm on 1 July, but was not detected until 14 July at the end of the drip line. Organic matter had built up in the drip line from earlier irrigation, which tied up the chlorine. The chlorine level ranged from 1-4.0 ppm at the intake and between 0.5 to 1.5 ppm in the line during the sampling period. *E. coli* in the pond ranged from 110 cfu/100 mL to 800 cfu/100 mL while at the end of the drip line it was less than 10 cfu/100 mL for all sampling dates. This system adequately controlled *E. coli* and would be easy for a grower to manage.

## **Poster Session: Thursday, 7 Jan. 2010**

### **Assessment of Physical Properties and Stonecrop Growth in Green Roof Substrates Amended with Compost and Hydrogel**

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There is a lack of quantifiable data concerning physical analyses specific to shallow-depth green roof substrates and their effects on initial plant growth. Variables affecting substrate performance and subsequent plant growth may include depth of substrate, local environmental conditions, and substrate components. Physical properties were determined for green roof substrates containing (by volume) 50%, 60%, or 70% heat-expanded coarse slate and 30% heat-expanded fine slate amended with 20%, 10%, or 0% landscape and greenhouse waste compost. Each substrate also was amended with hydrogel at 0, 0.45, 0.90, or 2.25 kg·m<sup>-3</sup>. Container capacity increased in substrates containing hydrogel (rate = 2.25 kg·m<sup>-3</sup>), except for substrates containing 10% compost where hydrogel had no effect. Aeration porosity decreased when 10% or 20% compost was added to substrates. Determination of aeration porosity at an applied suction pressure of 6.3 kPa (AP<sub>-6.3 kPa</sub>), indicated that AP<sub>-6.3 kPa</sub> was higher in substrates containing 0% compost than substrates containing 20% compost. Shoot dry weight and coverage area measurements of 'Weihenstephaner Gold' stonecrop (*Sedum floriferum*) and 'Summer Glory' stonecrop (*S. spurium*) were determined 9 weeks after plug transplantation into substrates. Both stonecrop species responded similarly to substrate amendments. Initial plant growth was greater in substrate containing 20% compost and hydrogel (rate = 2.25 kg·m<sup>-3</sup>) than non-amended substrate resulting in 198% and 161% higher shoot dry weight and coverage area, respectively. Alkaline heat-expanded slate and acidic compost components affected initial pH of substrates, but there was less variation among final substrate pH values. We conclude that compost and/or hydrogel amendments affected physicochemical properties following incorporation into slate-based green roof substrates, resulting in greater initial growth of stonecrop.

### **Cranberry Growth and Yield Components Are Impacted by Irrigation Water Containing Salt**

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To investigate the potential negative effects of the migration of road salt runoff into cranberry irrigation ponds, cranberries were exposed to varied concentrations of chloride (Cl) in both greenhouse culture and in the field. Previous work by DeMoranville, Davenport,

and Roper (as reported at the 2003 NACREW meeting) indicated adverse effects on cranberry soil and cranberry plants with exposure to chloride concentrations of 100 or 250 mg·L<sup>-1</sup>. These effects included changes to soil chemistry, visible symptoms on plant leaves, mild stimulation of runner growth, and suppression of flowering. However, these studies were conducted in greenhouse sand or soil-free culture and were not designed to examine crop yield. Cranberries were grown in a sand-peat mix that mimicked field soils and were assigned to two experiments. In the first, plants were irrigated with solutions containing NaCl at Cl rates of 0, 50, 100, or 250 mg·L<sup>-1</sup>. In each 7-day period, treatments were applied for 6 days and on the 7th day, all treatments received water with no Cl to simulate periodic rain. In the second experiment, plants were irrigated with solutions containing NaCl at Cl rates of 0, 50, 100, or 150 mg·L<sup>-1</sup> on all days. As was the case for sand-grown plants in previous studies, there was greater runner biomass and fewer flowers produced on plants exposed to 250 mg·L<sup>-1</sup> Cl in 6 of each 7 days compared to control plants. When exposure increased to all days, plant biomass decreased linearly with increased Cl. Field plots were established and were irrigated with 0, 50, 100, or 200 mg·L<sup>-1</sup> Cl as NaCl once per week in the cooler portions of the growing season and twice weekly during the summer. Treatments continued for two growing seasons. Plots were evaluated by analysis of soil and plant tissue samples, determination of upright density (using ring sampling technique), and by collecting fruit samples to determine number and weight of berries (yield). After two years, as Cl concentration increased, runner production increased linearly and yield decreased linearly. Cl exposure was associated with decline in upright density and aboveground biomass, decreased flowering and suppressed fruit set. Based on this research, growers should exercise caution when using irrigation water sources that have >100 mg·L<sup>-1</sup> Cl.

#### Performance of Small-fruited Pumpkin Cultivars in Maine

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A small-fruited (2-4 lb) or "pie" type pumpkin variety trial was established in the spring of 2009 at Highmoor Farm in Monmouth, ME. Three replications of seven varieties were direct-seeded on 18 June through black plastic mulch. Plots were 18 ft long with 3 ft between plants and 6 ft between rows. All fertilizer was applied according to soil test recommendations and incorporated prior to mulch application and seeding. Fruit were harvested on 18 Sept. Top performing varieties in terms of yield per plot included 'Chucky', 'Small Sugar', and 'Field Trip'. 'Fall Splendor' produced the largest fruit in the trial, followed by 'Winter Luxury' and 'Mystic Plus'. 'Field Trip' and 'Fall Splendor' had the highest stem quality in the trial and 'Field Trip', 'Mystic Plus', and 'Fall Splendor' were rated highest for exterior color and ribbing. The results of this trial suggest that 'Field Trip', 'Mystic Plus', and 'Fall Splendor' offer very high quality fruit with acceptable yields for pie-type pumpkins, while 'Chucky' offers acceptable fruit quality and very high yields.

#### Heirloom Tomato Variety Trial

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During the summer of 2009 we conducted an heirloom tomato variety trial using organic growing practices. As heirloom tomatoes and organic practices are becoming increasingly popular among the growers of Rhode Island, experimenting with new-to-the-market varieties would provide useful information to help produce more successful tomato crops across the state. Having University of Rhode Island (URI) staff experiment with different varieties in the field gives local growers a chance to see how the plants will perform without running the risk of losing their income to a failed crop, also we are able to grow 72 varieties at once, which may not be feasible for a farm. In addition to the varieties themselves, demonstrating organic practices will help educate local growers on how crops respond when cultivated organically and which heirloom tomatoes perform best when grown

organically. This can help conventional farmers as well, as they can see which varieties have the best pest resistance and incorporate those varieties into a lower input IPM crop at their farm. The crop was infected by late blight towards the end of the season and eventually spread to the entire field leaving us with a good set of data on late blight resistance by variety. All varieties were susceptible but some continued to perform better than others, and we were able to yield a small but edible amount of tomatoes from certain varieties. Ratings showed the variety Purple Calabash to be the most tolerant of late blight. Also notable is the variety Sungold, which is an orange cherry tomato that produced a good yield despite infection.

#### A Soil Fertility and Nutrition Program for Beach Plums

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Beach plums (*Prunus maritima*) are native to the coastal dunes of the northeastern United States. Beach plums are predominately a wild or semi-cultivated crop. Plants may be grown as shrubs or trained in various tree forms. Growers are establishing beach plum orchards for fruit production using various tree training systems. In an effort to gain further knowledge of cultural requirements for quality fruit production, a preliminary soil fertility and nutrition management plan has been developed. Members of the Cape May County Beach Plum Association along with Rutgers Cooperative Extension are applying and evaluating the following program based on soil testing and observations of plant conditions:

- Liming soil to establish and maintain a pH of 6.5-7.0.
- Application of K-Mag (0-0-22-11) to adjust soil potassium and magnesium supplies prior to planting, followed by annual fall applications of 400 lb of K-Mag to maintain soil supplies of K and Mg.
- Soil application of nitrogen (40 lb/acre) in March, with rate being adjusted according to shoot vigor and soil N supply. With very vigorous trees, N rate may be reduced by 50% or more, or eliminated for the year.
- Boron additions to the soil according to soil test requirements, plus annual foliar sprays of Solubor (1 lb/100 gal of dilute spray) combined with 9% EDTA-Zinc chelate (1 qt/100 gal) at the 1/2-inch green stage of foliage development.
- Foliar spray(s) of manganese sulfate in early summer where need is indicated by foliar symptoms of Mn deficiency.

#### Evaluation of Fungicide Chemistries and Programs for Practical Resistance Development in Cucurbit Powdery Mildew in New Jersey in 2009

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A pumpkin trial was established at the Rutgers Snyder Farm in New Jersey to evaluate fungicide chemistries and programs for practical resistance development in cucurbit powdery mildew. The percentage of upper or lower surfaces with powdery mildew infection varied significantly among fungicide programs. The non-treated control, had the highest percentage of upper (91%) and lower (78%) leaf surface with powdery mildew infection. The high percentage of lower leaf surface with powdery mildew infection in the weekly pyraclostrobin (FRAC code 11), boscalid (FRAC code 7) or pyraclostrobin + boscalid (FRAC codes 11 + 7) fungicide programs suggest

that “practical” resistance to either fungicide alone or combination had developed. Observing the loss of control by specific fungicides is often defined as “practical” or “field” resistance and is an indirect method used to determine resistance development or failures of fungicides in the field. Results suggest that resistance to FRAC code 7 and 11 fungicides in cucurbit powdery mildew control is likely to develop in the field in the Northeast and their use in cucurbit powdery mildew control programs should be limited because of the potential for resistance development. The three fungicide programs that contained Bravo + Rally (FRAC code M5 + 3) had the lowest defoliation ratings of (2) 11% and (1) 21 %.

#### **Yellow Vine Syndrome of Cranberry in Massachusetts: HPLC analysis of Xanthophylls Cycle**

Lien-Yang Chou<sup>1\*</sup>, Ndi Geh<sup>1</sup>, Sean Cederlund<sup>1</sup>, Peter Jeranyama<sup>2</sup>, Carolyn DeMoranville<sup>2</sup>, and Harvey J.M. Hou<sup>1</sup>; <sup>1</sup>Department of Chemistry and Biochemistry, University of Massachusetts Dartmouth, 285 Old Westport Rd, North Dartmouth, MA 02747; <sup>2</sup>University of Massachusetts Cranberry Station, One State Bog Rd., East Wareham, MA 02538

Yellow vine syndrome of cranberry has been observed in cranberry bogs. It becomes severe when the plants require resources during fruit development and likely affects the production of cranberries in Massachusetts. We previously explored the possible mechanisms for the formation of yellow vine of cranberry by spectrometric, HPLC, and in vivo chlorophyll fluorescence kinetic techniques. The yellow vine samples showed a significant loss in photosynthetic activity, indicating that the yellow vine syndrome may reduce the production and quality of cranberries in a long term. Our data support an idea that photo-inhibition is one important mechanism for the formation of yellow vine syndrome in cranberry plants in addition to the nutrition imbalance and water stress. The formation of yellow vine syndrome of cranberry may be due to the increasing of xanthophylls, which is the yellow carotenoid pigments in plants. The xanthophyll cycle involves the enzymatic removal of epoxy groups from xanthophylls (e.g. violaxanthin, antheraxanthin, diadinoxanthin) to create so-called de-epoxidised xanthophylls (e.g. diatoxanthin, zeaxanthin). These enzymatic cycles is one of the most efficient photoprotection mechanism in plants and can reduce the excess of light energy to reach the photosynthetic reaction centers. This work will apply reversed phase C-30 HPLC column to quantitatively determine the content of xanthophylls as well as detect the regulation of xanthophylls cycle in cranberry with yellow vine syndrome under high light conditions. This will provide novel insights into the mechanism of yellow vine development in cranberry. Supported by funding from USDA CSREES and UMD Cranberry Research Program.

#### **Leaf Gas Exchange in Cranberry Cultivars**

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Plant gas exchange, photosynthetic and stomatal activity data can provide a highly sensitive measure of the degree of water stress to which a plant is exposed. Recently introduced cranberry (*Vaccinium macrocarpon* Ait.) cultivars have not been evaluated for their photosynthetic capacities in comparison with the old and established cultivars. Two recently introduced cranberry cultivars were compared for their photosynthetic activity, gas exchange, stomatal conductance, and transpiration with three older cultivars. Measurements were made using an LCI Portable Photosynthesis System fitted with a conifer leaf chamber. Three measurements were made on each cultivar in a check-board at State Bog, Wareham, between 900 HR and 1500 HR in Aug. 2009. Leaf area index was obtained by destructive sampling of the portion of upright enclosed in the leaf chamber and were determined using a LI-3100 area meter. ‘Crimson Queen’, a new cultivar, had significantly greater photosynthetic rate compared with the rest, while ‘Early Black’ (EB), an older cultivar, had the least rate. ‘DeMoranville’ (new cultivar) and ‘Howes’ (old cultivar) had significantly higher transpiration rates than EB, which had the least rate. Photosynthetic rate increased with an increase in stomatal conductance and transpira-

tion rate increased curvilinearly with increase in stomatal conductance across all cultivars. Stomatal conductance explained 41% of variation in transpiration.

## **Oral Session II: Thursday, 7 Jan. 2010**

#### **Using Delayed Cooling to Prevent Chilling Disorders in ‘Honeycrisp’ Apples**

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Preconditioning, holding fruit at ambient temperatures for a short period after harvest prior to cold storage, has been inconsistent in preventing soft scald and soggy breakdown in ‘Honeycrisp’ apples. Fruit were harvested when starch index was 4.4, and a week later when starch index was 6.8, on a scale from 1 to 8. Preconditioning of 7 days at 17 °C was tested for interactions with harvest date in fruit from two orchards. This was compared to immediate cold storage after harvest. Both sets of fruit were stored at 1 °C for 2.5 months. Preconditioning had no effect on the number of fruit that developed soft scald with the first harvest when occurrence was 14% to 21% at Farm A and 2% at Farm B. With the second harvest, preconditioning decreased soft scald from 35% to 1% at Farm A, but not at Farm B where soft scald was 1% with preconditioning and 6% without. Soggy breakdown was increased by preconditioning from 2% to 16% with the first harvest in fruit from both orchards. With the second harvest, soggy breakdown was 20% with preconditioning compared to 3% without, but only in fruit from Farm B. Soggy breakdown was less than 1% at Farm A in both treatments. The effectiveness of preconditioning in preventing chilling injury depended on fruit maturity at harvest.

#### **Impacts of Rolled Cereal Rye Seeding Rates and Fertility Effects on Weed Suppression and Community Composition**

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Reducing pre-plant tillage is gaining popularity among growers because of the soil health benefits and the potential to save time. In organic rotational no-till systems, mulch is used to suppress weeds in no-till planted cash crops rather than herbicides or cultivation. Applying mulch to large areas is often unfeasible and thus many growers are using cover crops that are mechanically terminated to grow their own mulch in situ. The mechanisms by which cover crop residue suppresses weeds has been well documented and includes reducing light penetration and lower the temperature at the soil surface, creating obstacles for weed growth, and through allelopathy. It is also well understood that weed suppression increases with residue quantity. Achieving adequate cover crop biomass for weed suppression can be challenging. Therefore the objective of our study was to quantify the effects of increasing cereal rye seeding rate and applying fertilizer on weed suppression in organic rotational no-till systems. We hypothesized that summer annual weed suppression will increase with cereal rye seeding and fertilizer rate. Field experiments were conducted at the Lower Eastern Shore Research and Extension center in Salisbury, MD, and at the Rodale Institute in Kutztown, PA, in 2008 and 2009, providing four site years. Poultry litter pellets were applied at 0, 80, and 160 kg N ha<sup>-1</sup> in a factorial with three cereal rye seeding rates; 90, 150, 210 kg seed ha<sup>-1</sup>. The cereal rye cover crop was terminated with a roller-crimper at anthesis and weed suppression was monitored for 10 weeks in the absence of a crop. Cereal rye biomass, ground coverage, weed density, and weed biomass by species were quantified. Cereal rye biomass increased with increasing seeding and fertility rate, and ranged from 6300 to 8070 kg·ha<sup>-1</sup>. Weed suppression increased with cereal rye seeding rate. Although increasing fertility led to an increase in cereal rye biomass, weeds also took advantage of the added fertility resulting in an increase in both weed density and biomass. Our findings suggest that increasing rye seeding rate can increase weed suppression in

organic systems that rotate to no-tillage crop plantings, and that this tactic may be more beneficial than fertilizing the cover crop.

### **Effect of Mulch Color and Thrips Population on Size and Quality of Sweet Onion**

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Production of sweet onions for the PA Simply Sweet® Program has become a profitable option for growers seeking to diversify their farming operation. Control of onion thrips, the main insect pest on this crop, is a concern because of resistance issues. ‘Candy’ onions were planted on three mulch colors in 2008; after thrips populations developed half of each plot was sprayed with spinetoram to control the thrips. Counts of thrips per leaf were highest on white mulch prior to spraying while there was no difference between black and silver. White mulch had the highest visual damage rating prior to spraying followed by black and silver. Onions grown on white mulch had the highest soluble solids while those grown on black and silver were the same. Onions grown on silver mulch had the largest average bulb size, black was intermediate and white was the smallest. Spintoram treatments resulted in reduced thrips counts, lower damage ratings, higher soluble solids and increased bulb size.

### **Performance of Six Early Fuji Cultivars in New Jersey**

*Win Cowgill*<sup>1\*</sup>, *W. Autio*<sup>4</sup>, *E. Dager*<sup>3</sup>, *S. Sollner-Figler*<sup>1</sup>, *R. Magron*<sup>1</sup>, *M. Maletta*<sup>1</sup>, *M. Muehlbauer*<sup>2</sup>, and *G. Sliffer*<sup>3</sup>; <sup>1</sup>*New Jersey Agricultural Experiment Station-Rutgers Cooperative Ext. of Hunterdon County, PO Box 2900 Flemington, NJ, 08822-2900*; <sup>2</sup>*Rutgers University, School of Environmental and Biological and Sciences, New Brunswick, NJ*; <sup>3</sup>*New Jersey Agricultural Experiment Station, Rutgers Snyder Farm, Pittstown, NJ*; <sup>4</sup>*University of Massachusetts, 205 Bowditch Hall, Amherst, MA 01003-9294*

Early ‘Fuji’ strains ripen 3-5 weeks earlier than regular ‘Fuji’ in New Jersey, giving them a significant marketing advantage. In two research trials, 2002 and 2007, established at the Rutgers Snyder Farm in Pittstown, NJ, six early ‘Fuji’ cultivars are under evaluation. Cultivars include ‘Rising Sun’™, ‘Beni Shogun’®, ‘Early Auvil’™, ‘September Wonder’®, ‘Daybreak’™, and ‘Morning Mist Fuji’™. The 2002 trial was managed as super spindles (4300 trees/ha). The 2007 trial took the two best performing cultivars Rising Sun and September Wonder and added Daybreak and Morning Mist, managed as tall spindle (2564 trees/ha). ‘Rising Sun’ had the highest cumulative yield in the 2002 trial, 184 MT/ha (04-09). Daybreak Fuji had the highest cumulative yield in 2007 trial 20.3 MT/ha (08-09) reflecting higher tree quality at planting as compared to the other cultivars. All six cultivars were large fruited and had commercially acceptable red color in both trials. Stem splitting was low, with no significant differences between cultivars. Russet incidence was also low, with ‘Rising Sun’ having the smallest amount of russet and ‘September Wonder’ having the most in the 2002 trial. There were no significant differences between cultivars in flesh firmness, soluble solids, starch index rating, length-to-diameter ratio, or taste test rating in the 2002 trial in years 05-06. Russet incidence was low in the 2007 trial.

### **Vegetative Growth Response of ‘Chandler’ Strawberry to Foliar Applications of Trinexapac-ethyl**

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Foliar sprays of prohexadione-calcium (Apogee®), a gibberellic acid synthesis inhibitor, reduce runner production in strawberry plants,

and can thus lower labor costs for runner removal in plasticulture production systems. Trinexapac-ethyl (Palisade®), another commercially available gibberellic acid synthesis inhibitor, was applied to strawberry plants to determine its potential to reduce runner growth. ‘Chandler’ strawberries were planted into pots on 24 July, 2009 and grown in a greenhouse in Monmouth, ME. The plants were grown under artificial light to maintain the day length at 16 hours to encourage runner development. The plants were treated with foliar applications of trinexapac-ethyl on 1 Sept., after runners began to emerge from the plants, at concentrations of 50, 100, 150, or 200 ppm. A treatment of 200 ppm prohexadione-calcium was included as a reference. Plants were evaluated on 10 Nov. for vegetative development. The trinexapac-ethyl foliar treatments had no significant effect on the number of runners produced by the plants, although they did reduce runner internode lengths and dry weights at the higher concentrations. In contrast, the prohexadione-calcium treatment significantly reduced the number runners by nearly 40%. The trinexapac-ethyl treatments did not significantly impact strawberry plant leaf number, petiole length, root length or plant dry weights. While trinexapac-ethyl can reduce vegetative growth in some plants in a similar manner to prohexadione-calcium, the application rates and timing of these two products to reduce runner growth in strawberries apparently differ. More work with trinexapac-ethyl will be needed to determine its potential for runner management in strawberries.

### **Yellow Vine Syndrome of Cranberry in Relation to Nutrition Imbalance, Water Stress, and Photosynthesis**

*Zi Wei*<sup>1</sup>, *Fan Zhang*<sup>1</sup>, *Lien-yang Chou*<sup>1</sup>, *Peter Jeranyama*<sup>2</sup>, *Carolyn DeMoranville*<sup>2</sup>, and *Harvey J.M. Hou*<sup>1\*</sup>; <sup>1</sup>*Department of Chemistry and Biochemistry, University of Massachusetts–Dartmouth, 285 Old Westport Rd, North Dartmouth, MA 02747*; <sup>2</sup>*University of Massachusetts Cranberry Station, One State Bog Rd., East Wareham, MA 02538*

The production and quality of cranberries may be affected by environmental stress. Yellow vine syndrome, interveinal chlorosis moving from older to younger leaves, has been observed in cranberry bogs. The reason for the development of the syndrome is unknown. Our goal is to investigate the mechanisms underlying yellow vine syndrome in cranberry plants and as a result develop a strategy to solve the problem. A complete nutrition analysis suggests that a nutrition imbalance might be associated with yellow vine development in cranberry. Additionally, the yellow vine syndrome often worsens in bogs with drainage problems, indicating that water stress may be another factor in the formation of yellow vine in cranberries. Recent spectrometric analysis revealed that the yellow vine leaves showed a 26~28% loss in chlorophyll compared to normal leaves. In addition, shading of yellow vine cranberry plants appeared to reduce the syndrome and increased the chlorophyll content by 14% ± 2%. An in vivo chlorophyll fluorescence analysis indicated that the yellow vine leaves showed a loss of 34% ± 5% in the maximum quantum efficiency of PS II. As PS II is the main target of photoinhibition, the chlorophyll fluorescence data support a crucial role of photoinhibition in producing yellow vine syndrome in vivo. More recently, the presence of herbicide Casoron induced the yellow vine symptom of cranberry. In summary, the yellow syndrome of cranberry may be associated with 1) the nutrition imbalance, 2) water stress, 3) photodamage, 4) herbicides, and 5) bacterium or virus. Our future efforts of probing yellow vine formation of cranberry will be placed on 1) the generation of yellow vine phenotype in green house by water, nutrition, herbicide and photodamage, 2) the HPLC analysis of the xanthophyll cycle, 3) profiles of chlorophyll degradation and biosynthesis, 4) identification of yellow vine genes by the 454 cDNA sequencing, and 5) identification of possible microbe pathology. Supported by funding from USDA CSREES, UMD Chancellor’s Research Fund, and UMD Cranberry Research Program.