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Agricultural Water Use Certification and Registration Programs in New Jersey

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In the state of New Jersey, farmers must certify or register their agricultural water use with the New Jersey Department of Environmental Protection (NJDEP). The forms are initially processed through agricultural agents in the counties, who work with individual farmers to calculate needed amounts of water to produce crops to include on applications for permitted use. Additionally, agents interpret regulations and assist farmers with initial and 5-year renewal applications and reporting forms required for this legislated program. Registration permits are obtained if the farmer does not pump in excess of 70 gallons per minute from water sources and uses less than 3.1 million gallons of water per month. If water use is in excess of these amounts then the farmer must apply for a water certification permit. In addition to the application, a public notice must be posted in the local newspaper to offer a public hearing if adjacent landowners want to dispute the application. Once approved, a certification or registration is renewed with the NJDEP every 5 years. Agricultural agents work directly with farmers to obtain renewals of these permits. The certification permit also requires submitting an annual water use report by 28 Feb. each year to the county agricultural agent. Both certification and registration permits require the farmer to record a daily log of water use from permitted sources. Agricultural agents educate farmers on how to accurately record water use and how to properly report and complete NJDEP-required forms and applications. <http://www.rce.rutgers.edu>.

3Effect of UV-C Irradiation on Nutraceuticals in Blueberries

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The effects of UV-C irradiation on total phenolics, total anthocyanin, antioxidant activity, and individual nutraceutical compounds in blueberries (*Vaccinium corymbosum* cv. Sierra) were studied. UV-C irradiation at 2.15 or 4.30 kJ·m⁻² increased total phenolics, total anthocyanin, and antioxidant activity in blueberries. UV-C irradiation at 0.43 or 6.45 kJ·m⁻² showed no significant difference in anthocyanin content, but UV-C at 0.43 kJ·m⁻² significantly increased total phenolics and antioxidant activity as compared to those in control fruit. UV-C irradiation at 2.15 or 4.30 kJ·m⁻² also enhanced blueberry fruit content of phenolic acid, flavonol, and anthocyanin, such as chlorogenic acid, resveratrol, myricetin 3-araboside, quercetin 3-galactoside, quercetin 3-araboside, quercetin derivative, kaempferol 3-glucoside, delphinidin-3-galactoside, cyaniding 3-galactoside, delphinidin 3-araboside, petunidin 3-galactoside, petunidin 3-glucoside, malvidin 3-galactoside, and malvidin-3-araboside, as analyzed by HPLC. UV-C irradiation at 0.43 or 6.45 kJ·m⁻² also increased chlorogenic acid, resveratrol, quercetin derivative, and kaempferol 3-glucoside content. These results indicate that adequate treatment with UV-C not only can promote antioxidant activity, but also can improve the nutraceutical quality of blueberry fruit.

Performance of Four Early 'Fuji' Cultivars in New Jersey

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Retail-oriented apple producers in the Northeast and mid-Atlantic states have a tremendous interest in early 'Fuji' strains. They strive

to satisfy the consumer demand from ethnic populations who prefer 'Fuji' to other apples. Early 'Fuji' strains ripen 4 weeks earlier than regular 'Fuji', giving them a marketing advantage. Four early 'Fuji' cultivars, 'Rising Sun'TM, 'Beni Shogun'[®], 'Early Auvil'TM, and 'September Wonder'[®], on B.9 rootstock were planted at the Rutgers Snyder Research and Extension Farm in Apr. 2002. Thirty to 50 trees per cultivar were planted and managed as super spindles (4300 trees/ha). All fruit are similar in appearance to traditional 'Fuji'. Tree establishment and subsequent management were identical. Trees were grown under New Jersey/Rutgers IPM standard production practices. All trees began fruiting in the third leaf. 'Rising Sun' had the highest annual yields in 2004 and 2005. All four cultivars were large fruited, averaging 253 g in 2005 and 218 g in 2006. All four cultivars had commercially acceptable red color. In 2005, 'Beni Shogun' had significantly better red color than the other cultivars, and in 2006 'Beni Shogun' and 'September Wonder' had significantly better red color than 'Rising Sun' and 'Auvil Early'. There was a significant interaction between year and cultivar, but 'Beni Shogun' had the most red color in both years. 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. There were no significant differences between cultivars in flesh firmness, soluble solids, starch index rating, length-to-diameter ratio, or taste test rating.

Evaluation of Home Garden Tomato Varieties in New Jersey

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Twelve varieties of tomatoes were evaluated for yield and quality attributes at the Rutgers Agricultural Research and Extension Center (RAREC) in Bridgeton, N.J. The trial was planted on 4 May 2006 with eight plants per plot with three replications on high raised beds at 5-foot centers. Plants were staked and tied three times. Harvest began on 20 July with the last harvest on 11 Aug. Tomatoes were harvested weekly and graded and weighed on the same day. They were categorized as edible or inedible. Inedible tomatoes were those with any amount of rot, excessive cracking, or excessive insect damage. Taste testing was conducted at the Gloucester County Fair and at a twilight meeting at RAREC. 'Early Girl' had the highest yield with an average season weight per plant of 9.7 lb. 'Champion', 'Celebrity', 'Beefmaster', and 'Supersteak' followed with weights of 8.5, 8.2, 8.1, and 8.0 lb, respectively. 'Rutgers' had the lowest yield, averaging just 5.1 lb per plant for the season.

Guidelines for Starting a Horticultural Therapy Program by Partnering with Volunteers

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Volunteers can play an important role in acquainting local agencies that serve people with disabilities with horticultural therapy (HT). HT, as defined by the American Horticultural Therapy Association, is the engagement of clients in gardening-related activities, facilitated by a trained therapist, to achieve specific treatment goals. Rutgers Cooperative Extension has published a manual to provide volunteers

and agency administrators with guidelines for starting a HT program. The manual describes the benefits and goals of HT programs and promotes the HT profession. The manual gives advice on HT program coordination details from volunteer training to agency support. Detailed lesson plans for 12 HT activities and appendices with horticultural information, and professional HT resources are included. Information on the manual is available at www.rce.rutgers.edu.

Effect of Degree and Duration of Shade on Quality of Greenhouse Tomato

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Some amount of shade may be optimal to produce high quality tomatoes in a greenhouse during summer months in the northeastern United States. Simultaneous comparisons were made among greenhouse sections that were either not shaded, or covered with reflective aluminized shade cloth that attenuated 15%, 30% or 50% of direct sunlight. The shade cloth was applied at the start of warm weather in June. The houses were shaded for the rest of the summer, and fruit was picked until late August. Total yield decreased linearly with increasing shade, but there was no significant difference among shade treatments in marketable yield. The fraction of fruit that was marketable was greatest for plants grown under 50% shade. This fraction was 9% greater than in a greenhouse with no shade in 2003, and 7% greater in 2004 and 2005. Cracked skin was the defect most affected by shade. Among sensitive cultivars, up to 35% of the fruit produced in greenhouses with no shade had cracked skin, whereas in greenhouses covered with 50% shade, only 24% to 26% of the tomatoes had cracked skin. There was no consistent trend with shade in the fraction of fruit with green shoulder, blossom end rot, or irregular shape. The effect of shade increased with the duration of shading. There was no effect of 50% shade compared to no shade on total yield within 20 days, but yield decreased by 20% in the interval from 25 to 45 d after shading, and by 30% after more than 45 d of shading in 2005. Marketable yield only decreased after more than 45 d of shading for cultivars that were not sensitive to cracked skin or uneven ripening. Shade decreased fruit size over the entire season only in 2003. In general, shading increased the fraction of marketable tomato fruit without sacrificing fruit size.

Reducing Pesticide Inputs in Nurseries using a Portable Hot Water Immersion System

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Concerns about unnecessary exposure to chemicals has prompted many owners to look for alternative methods to deal with insect and mite control that place less reliance on pesticide applications. The problem is that small insects and mites present on the cuttings frequently go undetected at the propagation stage, resulting in pest outbreaks when plants are moved to nursery benches or production greenhouses. This project involves controlling nursery pests early in the production cycle to reduce the need for pesticide inputs. Our method of treating plant cutting material with hot water at set temperatures and treatment times before it is moved to the propagation stages will control several of the major pests of nursery plants. We built a mobile, insulated tank with a controlled hot water recirculation system that works in temperate regions to treat pests on nursery plants at the propagation stage. Whole-plant cuttings were submerged in water held at a constant temperature for a set amount of time, with the water being circulated around the plant cuttings. The treated cuttings were then cooled using water at 50 to 60 °F for 60 to 120 seconds. The cuttings were then stuck as in normal propagating methods. We have

been working to establish what temperatures and lengths of immersion different species of nursery plants can tolerate without interfering with the plant propagation system.

Yield, Plant Architecture, and Machine Harvest Characteristics of Several Leafy Greens Grown for Processing *James L. Glancey, Bioresources Engineering and Mechanical Engineering, University of Delaware, Newark, DE 19716*

Several leafy greens are grown in the mid-Atlantic region for processing (freezing), including spinach, kale, turnip greens, mustard greens, and collards. Although production of these specialty crops has been mechanized, current production practices are expensive, especially harvest costs. In addition to high maintenance costs associated with the machines currently used for harvest, in-field harvest losses often exceed 20% of the yield. To address these limitations, a study was initiated to understand the once-over harvest characteristics of these crops and to develop a more cost-effective harvesting system. In a commercial bed production setting, yield and plant architecture were measured for five different small greens. Using a harvester equipped with a new band saw-type cutting mechanism, harvest recovery characteristics were measured for each of these crops during the first cutting of the season. On average, harvest loss was lowest for spinach, averaging about 800 kg·ha⁻¹ (10% of the yield). Collards exhibited the poorest recovery characteristics, averaging more than 4 Mg·ha⁻¹ (20% of yields). In general, losses during harvest correlated very well with the size of the plant leaf, suggesting that a single harvester for all small greens may not be economically viable.

High-speed Mechanical Harvesting of Spinach

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Spinach grown for processing is an important high-value crop in Delaware, New Jersey, and the eastern shore of Maryland. Current production methods utilize high-density precision planting on beds under sprinkler irrigation. Fall, winter, and spring crops can be grown, and each may be harvested as many as three times. Currently, all processed spinach is mechanically harvested; most harvesters use a single cutter bar with a reciprocating blade. High maintenance costs, excessive downtime, and high harvest loss are some of the problems limiting the performance of current harvesters. To overcome these limitations, a high-speed, low-maintenance cutter is being developed that utilizes a high-velocity continuous blade. Analysis of the blade stiffness and results from preliminary field tests revealed that blade stability for a 2-m span was a concern. A polymer blade guard was designed and installed, which provided continuous support for the blade across the cutting width. Field tests indicated that losses associated with the cutting mechanism averaged less than 2% of yield for both smooth-type and semi-savoy spinach varieties, and maintenance and downtime was significantly reduced by as much as a factor of 2. In addition, harvest speed can be increased to 8 km/hour, a 40% increase over the current harvesting method.

Vegetative Growth of Two Strawberry Varieties Affected by Prohexadione-calcium Root Dips and Foliar Sprays

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Dormant crowns of 'Allstar' and 'Jewel' strawberries grown in 1-gallon pots in a greenhouse were treated with prohexadione-calcium (Apogee®) at 150 ppm as root dips prior to planting with and without Agri-Gel, or as two foliar sprays 14 days apart at the first visible development of runners. The two cultivars varied significantly in their response to prohexadione-calcium root dips. The dips significantly delayed runner production in 'Allstar'. Although the plants had nearly the same number of runners as the control when harvested, the runners were much less developed. The root dips all but halted runner production in 'Jewel', but also resulted in some plant mortality. Foliar sprays of prohexadione-calcium reduced runner numbers fairly consistently between the two cultivars. Prohexadione-calcium treatments tended to increase leaf and branch crown numbers and total plant dry weight. From

this study, it appears that root dips and foliar sprays of prohexadione-calcium may provide an effective means of reducing runner plant production for strawberries grown on plasticulture in northern regions where fall planting is not feasible.

Effects of Top Mowing and Oil Applications to Silks on Sweet Corn Ear Quality and Insect Damage

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Methods to reduce pest damage without conventional pesticide applications are needed by growers seeking to reduce off-farm inputs and/or to adopt organic certification. "Topping" corn (removal of the stalk just above the ear) has been suggested as a means to reduce bird and insect damage in corn, and oil applications to the silk channels have been recommended to control corn earworm. Plots of sweet corn ('Nantasket' and 'Bojangles'), grown under conventional methods in Maine, were subjected to "topping" and oil applications to the silk channel of the ears following pollination to determine effects on corn ripening, ear quality, and bird and insect damage. Topping stalks above the ear tended to reduce ear length. Topping did not have a significant impact on maturity, but extended cloudy and wet conditions may have reduced the potential impact of this treatment. Oil treatments to the silk channel caused a significant amount of poor tip fill in the ears and some phytotoxicity (browning) on the kernels. Due to very low feeding pressure, no significant differences in insect or bird damage were observed between any of the treatments. Topping cornstalks may provide a means of improving harvest efficiency without significantly impacting yield. Oil treatments to the silk did not show significant reductions in insect damage, but did significantly reduce ear quality.

Effect of Flower Bud Removal on Fruiting in Red Raspberry: Evaluating Potential Impact of Strawberry Bud Weevil (*Anthonomus signatus*)

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Strawberry bud weevil (SBW), *Anthonomus signatus*, is a significant pest of strawberries in the Northeast, but is less well known for its detrimental affect on raspberries. The female SBW lays its eggs in flower buds and then clips the bud from the plant. Fruit yield compensation in response to clipped buds has been found in strawberry plants, which reduces the impact of this pest, but similar research has not been carried out on fruiting raspberry plants. The goal of this study was to evaluate the yield compensation potential of two raspberry varieties subjected to various levels of flower bud removal, as might be experienced under field conditions, when exposed to strawberry bud weevil. The results showed that the removal of flower buds, similar to strawberry bud weevil activity, generally reduced yield per lateral of raspberry canes. Yield effects varied according to bud position on the inflorescence and with variety. In 'Killarney', removal of primary buds increased fruit size of secondary buds, whereas in both varieties, removal of secondary buds did not significantly increase the size of primary fruit. Overall, compensatory abilities did not appear to be adequate to reduce the potential impact on yield of severe SBW injury. However, low levels of bud loss, even on primary or secondary buds, did not result in significant impacts on total yield.

Targeting Health and Wellness through Improving Community Knowledge of Local Food Issues

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In order to promote local agriculture and increase awareness of local food issues, interactive cooking demonstrations focusing upon local food were staged at the local hospital (Peninsula Regional Medical Center in Salisbury, Md.) in 2005 and 2006. More than 40 employees of the hospital engaged in discussion of farming issues, nutrition, and what foods are considered "local" in their area. Additionally, a public access channel (PAC) television show, "Delmarva Cooks" on PAC 14, has been an outlet for educating the public on local food issues. The shows focus upon cooking locally produced food, and expanding the viewer's culinary repertoire.

Effects of Soilless Bag Production and Soil Fumigation on the Development of White Mold (*Sclerotinia*) in Tomato High-tunnel Production

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In New Jersey, several commercial fresh-market tomato growers have adopted high-tunnel production to 1) have tomatoes available for early markets, 2) extend the production season into the fall for late markets, and 3) grow specialty varieties or "heirloom" tomatoes that are more prone to losses in yield due to weather contingencies (e.g., rain checking). While considered nonpermanent structures and movable, New Jersey growers who have kept high tunnels in the same location over several growing seasons have experienced serious losses to the soilborne disease white mold, caused by *Sclerotinia sclerotiorum*. A 1-year trial comparing fumigated and nonfumigated high-tunnel soil and open-field soil, all naturally infested with white mold, was conducted. Tomatoes grown in high tunnels without fumigation experienced more white mold when grown on black plastic mulch beds than when grown in soilless bags on soil covered in black landscape fabric 44 and 62 days after first harvest ($P = 0.0054$, Cochran-Mantel-Haenszel test). In nonfumigated high tunnels, after four successive tomato trials in previous years, the percentage of plants with symptoms of white mold was 3% in plants grown in soilless bags on soil covered with black landscape fabric, and 50% in plants grown in black plastic mulch beds. In fumigated high-tunnel soil, percent white mold was 0% in plants grown in soilless bags on soil covered with black landscape fabric, and 5% in plants grown in black plastic mulch beds. In adjacent field plots, after a similar tomato trial the previous year, the percentage of plants with symptoms of white mold was 3% for both soilless bags and field-grown plants in nonfumigated soil, and 0% for both in fumigated field soil. The number and weight of marketable fruit varied significantly depending on production method (high tunnel vs. field-grown) and system (soilless bag vs. ground) with significant interaction between harvest date, production method, and fumigation.

The "Salad Table": A New Tool for Expanding Home and School Food Production

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The public concern with food and health issues, such as obesity and fresh produce contamination, has contributed to increasing demand for organic and locally grown foods. While home and community gardens are important to many people, time and space constraints, and lack of knowledge, have prevented others from starting vegetable gardens. In 2006, eight "salad tables" were designed, built, and maintained as a SARE-funded demonstration project at the Central Maryland Research and Education Center. The "salad table" is a shallow wooden frame with a large surface area and mesh bottom designed primarily to produce a wide range of salad greens at waist level, from spring through fall. The 1.0-m² frames are easy and inexpensive to build, portable, and suitable for gardeners of all ages and abilities. Fifteen crops, three types of growing media, and four different fertilizers were trialed to establish benchmarks. Average yields for lettuce and mixed greens (900 g/frame) and snap beans (3.5 kg/frame) were higher than typical in-ground yields.

Growing Edible Flowers for Niche Markets

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Growing edible flowers has become almost a lost art in today's fast food society. However, growers who can create the niche market of

fresh organically grown food can also create an added value in the venue of organically grown edible flowers. It is important for every grower of edible flowers to research the truly edible flowers by their botanical names, then to grow the varieties that actually taste good. Each new variety developed for eye appeal might not be an excellent candidate for palate appeal.

Intellectual Property Rights Options for Breeders of New Plant Varieties

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Breeders spend time and money to develop new plant varieties. In order to recoup their costs, breeders have the opportunity to apply for intellectual property rights (IPR). In the United States, there are three main forms of IPR available to plant breeders: plant patents, plant variety protection, and utility patents. Each form has specific criteria for eligibility, and different limits on allowable usage and availability during the term of protection. Information will be presented to help judge the costs and benefits of each type of IPR.

Rain Garden Education: Bringing Groundwater Protection Home

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The Robinsons Branch of the Rahway River Watershed, located in Union and Middlesex counties, N.J., is moderately impaired for aquatic life, fecal-coli form, and total phosphorous. The installation of rain gardens into existing landscapes is a recommended best management practice to improve water quality in the watershed area. However, residential property owners need to be educated about how to design, install, and maintain rain gardens. In 2005, 31 Rutgers volunteer Master Gardeners completed a storm water management course that included training on rain garden installation and maintenance. In return for the training, the Rutgers Master Gardeners, in cooperation with the Rahway River Association, installed five demonstration rain gardens in public areas. The project was funded by a New Jersey Department of Environmental Protection grant. A USDA CSREES Region 2 Water Quality grant provided funds for public education at the demonstration sites. Two programs for children reached 85 elementary school students. Pre/post test evaluations about ways to protect groundwater showed that students could identify 50% more ways to protect groundwater than they could at the beginning of the program. Responses at the end of the program included using correct amounts of fertilizers, cleaning up after pets, maintaining cars, fixing discharge pipes, and planting rain gardens. Thirty adults, including a mayor, county legislator, county planner, and municipal planning board members participated in the adult programs. Pre/post test evaluations increased by 13%. Questions that participants improved their scores on were parts of the rain garden, proper depth of rain gardens, care of native grasses, and the limited use of fertilizers in rain gardens.

Transcript Initiation in Three Peach (*Prunus persica* L. Batsch.) Dehydrins: Tissue Specificity Differences in Two Promoters

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Plants must adapt to environmental stresses to survive. As a result, they have evolved numerous strategies to reduce stress-induced damage, ranging from adaptive morphological features to changes in gene expression that protect cellular components. A family of genes known as dehydrins has a role in stress protection specifically related to cold, dehydration, and salt exposure. We have been analyzing the expression of three dehydrin family members in peach, *PpDhn1-3*. All three genes are expressed in various tissues in the order bark > leaf > xylem > root > fruit. In addition, we have previously demonstrated that *PpDhn1* and 3

are primarily responsive to cold, whereas *PpDhn2* is primarily responsive to water deficit. Here we present the results of RNA ligase-mediated rapid amplification of cDNA ends (RLM-RACE) to identify the transcription start sites for these three genes in bark and fruit tissues. The results indicated that *PpDhn1* and 2 utilize different transcription start sites in developing fruit compared to bark sampled in July or December, whereas *PpDhn3* initiates at the same site in bark and developing fruit.

Development of a Native Alternative to Invasive Horticultural Plants: Softwood Cutting Propagation of *Lindera benzoin* (L.) Bl.

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The nursery industry has a need for economically valuable alternatives to invasive horticultural plants. *Lindera benzoin* has been suggested as a good native alternative to *Euonymus alatus*. Currently, large-scale production of cultivars of *L. benzoin* does not exist due to low rooting success. Development of a successful means of vegetative reproduction would increase the value of *L. benzoin* to the industry. Thirteen weekly softwood cutting trials of *L. benzoin* were done in Summer 2006. We examined effects of cutting source (stock plant), hormone treatment, and collection date [converted to base 50 °F growing degree days (GGD)] on rooting percentage, number of roots per rooted cutting, and mean root length per rooted cutting. It was determined that rooting percentage was highest when cuttings were collected between 347 and 919 GGD; cuttings of *L. benzoin* should be taken during this time. Cuttings taken between 919 and 1551 GDD rooted, but with low rooting percentage. No cuttings taken after 1551 GDD rooted. Hormone treatment had no effect on any rooting parameters; to save time and money, hormone treatment should not be used when processing softwood cuttings of *L. benzoin*. Cutting source affected all rooting parameters; further investigation is needed to determine whether this is due to genetics or stock plant age.

Regulation of Leaf Senescence and Bud Initiation in *Paeonia* Cultivars

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Peonies are popular plants that flower for a short period during spring. The availability is limited by the seasonal supply of propagules and flowering time in growing areas. This study explores the possibility of improving productivity and availability. Three herbaceous *Paeonia* cultivars were used alone or in combination in experiments to study leaf senescence and bud initiation from 2004 to 2006 in Ithaca, N.Y. During the fall, potted plants were treated either under outdoor and greenhouse conditions with natural light or long day (LD). *Paeonia* 'Barrington Belle' and 'Paula Fay' both increased the number of large buds at the end of fall in the greenhouse compared to those under normal photoperiod outdoors. The bud number of those outdoors at LD was similar to those in the greenhouse at 21.1/15.5 °C under natural light or LD. Leaf senescence was mainly affected by temperature for both varieties, with more pronounced photoperiod and its interaction with temperature in 'Barrington Belle'. Greenhouse-grown 'Shirley Temple' treated with LD had its sum of bud height twice of those under normal photoperiod. After receiving cold treatment under storage, separate batches of treated 'Paula Fay' and 'Shirley Temple' in 2005 flowered in the greenhouse in May, June, July, and Aug. 2006, confirming the effect of treatments to bud initiation. The findings show potential to enhance quality, increase availability, and develop pot-plant or cut flower protocols under different climatic conditions.

Effects of Sanding and Pruning on the Canopy Microclimate and Yield of 'Stevens' Cranberry

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The process of sanding is an important cultural practice in cranberry bog management. Among other things, sanding is used to

rejuvenate overly vegetative bogs and improve canopy microclimate. In recent years, sand has become increasingly expensive to buy and transport. As a result, there has been a search for a new strategy for bog management. In this study, a comparison of sanding and pruning was evaluated after one season based on berry yield, light and spray penetration into the canopy, and leaf wetness duration. Sanding and pruning were compared side-by-side at four intensities: control (0), light, medium, and heavy. Intensities of the treatments were designated by the number of times that the sanding or pruning equipment was passed over the plots; light intensity was one pass, medium was two passes, heavy was three, and the control was no passes. The sanding equipment was calibrated to deposit 1.5 cm of sand per pass. Pruned plots showed a significantly higher mean berry weight than the sanded plots. There was also a significant negative linear relationship between mean berry weight and increasing intensities of sanding/pruning. However, a significant positive linear relationship existed between light penetration and sanding/pruning intensity. Spray penetration was unaffected by sanding or pruning; penetration was complete in all treatments. Study of the effects of these procedures and intensities on anthocyanin concentration in cranberry is ongoing. A full analysis for all parameters will be completed after two growing seasons.

Growth Control of *Euphorbia pulcherrima* Willd. ex Klotzsch 'Sonara Jingle' and 'Sonora White' using Ethepon

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Poinsettia (*Euphorbia pulcherrima* Willd. ex Klotzsch) is a small tree native to tropical America. After more than 100 years of breeding and cultivation, the plant is widely used as a traditional Christmas decoration for its striking color bracts and contrasting color foliage. *Euphorbia pulcherrima* 'Sonora White' and 'Sonora Jingle' are new cultivars grown commercially in recent years. To produce better compact potted plants with the lowest financial input, ethephon was applied to these two cultivars. Height increased at a much lower rate after spraying ethephon and all treatments showed significant reduction in height of 'Sonora White' and 'Sonora Jingle'. The maximum reduction of height was 30.8% ('Sonora White') and 33.2% ('Sonora Jingle') with 700 ppm ethephon sprayed three times on 29 Aug., 20 Sept., and 13 Oct. 2005. The reduction rates for other treatments ranged from 11.5% to 23.7%. No significant difference on number of nodes was observed. But the length of internodes was significantly reduced from 18.4% to 42.4%, which resulted in compact plants. Significant linear relationships have been found between the relative height reduction and accumulative ethephon concentrations, which indicated that plant height could be controlled by adjusting total amount of ethephon application. Plant growth was significantly decreased under ethephon treatments. Dry weight reduction of 44.5% and 66.0% was recorded for 'Sonora White' and 'Sonora Jingle', respectively, with three applications of 700 ppm ethephon. Ethephon could effectively control height and reduce production expenses compared with other plant growth retardants. The proportional deduction of overall plant sizes led to better and more compact potted poinsettia. The delay of bloom time and production scheduling of growing poinsettia with ethephon should be in careful consideration.

Evaluation of Zucchini and Yellow Summer Squash Breeding Lines and Varieties for Powdery Mildew and Downy Mildew Tolerance

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Field research was conducted with 22 summer squash (*Cucurbita pepo*) breeding lines and varieties to evaluate tolerance to powdery mildew (*Podosphaera xanthii*) and downy mildew (*Pseudoperonospora cubensis*) infection under field conditions in 2005. Powdery mildew (PM) and downy mildew (DM) are important diseases of

cucurbit crops in the mid-Atlantic region of the United States annually during summer months. In New Jersey, powdery mildew is first observed in mid-July, and downy mildew historically is not found until mid-August in most years. However, during the 2004 and 2005 production seasons, downy mildew was identified approximately 2 months earlier than expected. In 2005, AUDPC values for powdery mildew development were lowest in 'Sunray', 'Wildcat', 'General Patton', 'Judgment III' (formerly 'EX04629728', released Dec. 2005), 'Justice III', 'Patriot II', and 'Payroll'. AUDPC values for downy mildew development were lowest in 'Lioness', 'Judgment III', 'Conqueror III', 'Cougar', 'SSX6593', 'Lynx', and 'Leopard'.

Accumulation of Manganese in Lowbush Blueberry

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The lowbush blueberry, *Vaccinium angustifolium* Ait., has been reported to have leaf Mn concentrations that would be toxic to most other plants, including highbush blueberry, *Vaccinium corymbosum*. Trevett (1972) suggested a satisfactory range between 750 and 1490 ppm for lowbush blueberry. We studied the Mn concentrations in leaves and fruit of seven lowbush blueberry clones and attempted to alter their Mn content with soil-applied Citraplex (20% Mn) (Nortrace, Ltd). Leaves from the field in which the clones were growing had 2002 leaf tissue Mn concentrations averaging 595 ppm, well below the 750 ppm standard. Within each clone, sixteen 0.61 m × 0.61 m treatment plots were created by cutting through the rhizome system to prevent lateral movement of nutrients between plots. Citraplex 20% manganese was applied as a soil drench in mid-May 2004 at 0, 1.12, 2.24, or 3.36 kg-ha⁻¹ Mn in a 750 mL water solution. Nutrient analysis of composite leaf samples from 20 randomly selected stems taken on 6 July 2004 indicated that leaf Mn concentrations were not affected by the Mn treatments. Significant differences in leaf Mn concentrations were found among the clones, ranging from 559 to 1258 ppm, even though soil samples taken within clones showed no differences in soil Mn concentrations. No correlation between leaf and soil Mn concentrations was observed. This suggests that clonal genetics may influence Mn uptake. Leaf Mn was negatively correlated with soil Ca, confirming previous reports. Fruit nutrient concentrations were determined by analyzing fruit from control plots and correlated with leaf nutrient concentrations. A significant positive Pearson correlation ($R^2 = 0.74$) was found between leaf and fruit Mn concentration among the clones.

Growth and Yield Improvement of Newly Planted 'Honeycrisp' Apple Trees with Preplant Soil Amendments and Rootstocks

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Preplant soil-incorporated compost, mycorrhizal inoculation (MI) at planting, and the combination of the two were tested for growth and yield increase of 'Honeycrisp' apple trees on two rootstocks, M.26 and G.16. Four and five years after planting when trees had their first crops, MI increased annual trunk growth, but not when combined with compost. MI increased bloom in the fifth year, but did not increase yield. Compost did not increase trunk growth in the fourth year, but did in the fifth when crop load was very small. Compost increased yield in the fourth year, but not in the fifth year as a result of biennial bearing. Trunk growth was greater with G.16 in the fourth year, but not the fifth year. G.16 had greater yield in both the fourth and fifth years.

Effect of Fertilizer Rates and Materials on Bell Pepper Silvering (Skin Separation)

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In previous years, silvering in bell pepper fruit has been consistently observed in bell pepper breeding lines and cultivars with tolerance to *Phytophthora capsici* in New Jersey. For some commercially available phytophthora-tolerant cultivars, the disorder can be as

high as 60%. According to new USDA grading standards, #1 bell peppers can have no more than 10% fruit with silvering, along with other defects. Early research has shown that production systems may also influence the amount of silvering that develops in bell pepper fruit. Two cultivars ('Aristotle', phytophthora-tolerant; and 'Camelot', phytophthora-susceptible) were arranged in a split block design with cultivar as main block and six fertility rates or materials as split block. Fertility treatments were 1) 180 lbs/acre (201.8 kg·ha⁻¹) Nitrogen; 2) 300 lbs/acre (336 kg·ha⁻¹) N; 3) Nitamin-30L 180 (201.8 kg·ha⁻¹) N; 4) Nitamin-30L 135 lbs/acre (151 kg·ha⁻¹) N; 5) Nitamin-43G 180 lbs/A (201.8 kg·ha⁻¹) N; and 6) Nitamin-43G 135 lbs/acre (151 kg·ha⁻¹) N. Treatments 1–4 were applied through the drip on a weekly basis for 12 or 15 weeks. Treatments 5 and 6 were granular materials applied after bed making, but prior to laying plastic in two bands per bed, 2 inches (5 cm) from the drip tape. Phosphorus, potassium, and boron were applied as needed to maintain equal levels for those nutrients. Each plot was harvested six times and fruit graded and weighed according to marketable, marketable with silvering, and culls. There were three-way interactions for the 'Aristotle' at harvest 2, and for 'Camelot' at harvest 5. All two-way interactions (harvest × variety) were significant with 'Aristotle' producing more fruit with silvering at each harvest date. Nitrogen fertility rate does not appear to be a factor in the development of silvering in bell pepper fruit.

Breeding and Genetics of Egg and Spoon Gourds (*Cucurbita pepo* L.)

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Ornamental gourds of *Cucurbita pepo* ssp. *ovifera* (L.) Decker, although native to the Americas, are represented in 16th century European herbals, so they have a history of ancient use in both hemispheres. Two types of *C. pepo* ornamental gourds, egg and spoon, are well described in Bailey's classic book, *The Garden of the Gourds*, published in 1937, and are the focus of breeding work at the University of New Hampshire. Our main objective has been to transform egg gourd from a late-maturing, monotypic white-fruited type with a spreading growth habit into an earlier-maturing, multicolored egg gourd with concentrated set on a bush plant. Similar objectives pertain to spoon gourds with the exception that more color variation already existed in this gourd type. Earlier maturity, the bush habit, and solid green rind color (B⁺B⁺, L-1L-1, L-2L-2) were transferred from a small-fruited breeding line of pumpkin into egg and spoon phenotypes. Crosses between bush white egg and striped, bicolor spoon lines were used to introduce striped fruit rind (1-1^{BS1}), along with the precocious yellow color gene (B) into an egg background, and bush habit and earlier maturity into spoon germplasm. Currently, we have genetically homozygous egg lines displaying solid orange (BB, L-1L-1, L-2L-2, wfwf), solid green (B⁺B⁺, L-1L-1, L-2L-2, wfwf), white and green stripe (B⁺B⁺, 1-1^{BS1}1-1^{BS1}, L-2L-2, WfWf), and yellow and green strip (B⁺B⁺, 1-1^{BS1}1-1^{BS1}, L-2L-2, wfwf) at fruit maturity (50 to 55 d). Bicolor patterns have been achieved in certain hybrid combinations. In spoon, we have early generation lines with solid white, solid green, solid yellow, solid orange, and various striped and bicolor patterns in all of the above color types. The reverse strip trait has recently been transferred into the egg germplasm, and is also being transferred into spoon phenotypes.

Preliminary Review of Zinnia and Sunflower Cultivars for Cut Flower Production in New Jersey

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Direct-market cut flower variety trials were conducted on five zinnia and sunflower varieties at the Rutgers Agricultural Research and Extension Center (RAREC) in Bridgeton, N.J., in 2006. The pollen-

less sunflower varieties evaluated included 'Moulin Rouge', 'Pro Cut Yellow Lite', 'Soraya', 'Sunny', and 'Sunrich Gold'. Varieties were quantitatively assessed for yield, degree of trait-expression-as-advertised, stem length, and flower diameter. Observational data indicated 'Sunny' (F₁ hybrid) as having the best flower quality, stem length, and flower size uniformity during the course of the trial. 'Soraya' exhibited good quantity and uniformity, but was extremely susceptible to flower damage caused by the sunflower moth larva (*Homeosoma electellum*). 'Moulin Rouge' produced prolific burgundy blooms, although most were unusable due to an inadequate stem length necessary for the cut flower market. In addition, 'Moulin Rouge' also exhibited early petal-fall, making some harvested flowers unsalable. Flower heads of 'Sunrich Gold' developed seed resulting in a "bent face" and making flowers too heavy for cut flower use. 'Pro Cut Yellow Lite' flowered earliest and generated large, salable, good quality flowers but produced only one cutting per plant. Marketable yield, degree of trait-expression-as-advertised, stem length, disease incidence, and flower diameter were also evaluated for five varieties of zinnia ('Benary's Giant' Mix, 'Oklahoma' Mix, 'Peppermint Stick', 'Whirligig', and 'Zowie! Yellow Flame') and were evaluated in Pitts-town and Bridgeton, N.J. A postharvest study to determine the capacity to sustain quality over time resulted in significant differences ($\alpha = 0.05$) between zinnia varieties. Three reps of 10 marketable stems of each variety were placed indoors at room temperature in either tap water or Floralife[®] solution and assessed daily from 1 d after harvest (DAH) until 11 DAH with postharvest quality of each flower measured as follows: 5 = optimal, 4 = good, 3 = fair, 2 = poor, 1 = dead. By 2 DAH flower quality of 'Whirligig' declined significantly compared to all other varieties. On 5 DAH in Floralife[®], 'Benary's Giant', 'Oklahoma,' and 'Peppermint Stick' had the highest average quality ratings of 3.4, 3.2, and 3.1 vs. 1.9, 2.6, and 1.7 in tap water. Overall, 'Zowie!' and 'Whirligig' had the poorest postharvest quality ratings.

Mini Melons: A New Value-added Crop for the Mid-Atlantic?

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Mini cantaloupes are growing in popularity as a niche crop grown in many parts of the country. Eight heirloom varieties were tested at the University of Maryland Lower Eastern Shore Research and Education Center in Salisbury from 2005 to 2006. The melons were grown on grown on raised beds with 8 inches of straw as mulch in 2005 and on black plastic in 2006, both years with trickle irrigation. The melons were grown under an organic production system in a RCB design with four reps. Yield and fruit quality were measured and a postharvest taste test was conducted. 'Sierra Gold' appears to be the easiest to introduce to the public, as it has the highest yield, quality, and overall likability. 'Golden Jenny', 'Jenny Lind', and 'Minnesota Midget' were also well received and yielded well for being smaller melons.

Nitrogen Requirements of Annual Day-neutral Strawberries

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Several high altitude sites exist in the Appalachian region that have cool summer weather conducive to "off-season" strawberry production using day-neutral cultivars. While efforts are ongoing to develop an industry there, our report investigates several management factors needed for day-neutral strawberry production in this region. In this report, nitrogen source (compost vs. soluble) and concentration, the effect of tunnels, and green mixed *Brassica* manures were investigated for plasticulture plantings in Maryland and Pennsylvania. Nutrient responses were not consistent between sites, and green manure did not enhance yield in a field previously planted to several vegetable crops. Tunnel-grown plants did not outyield outdoor plants, but there was a difference in season. Although not directly compared, 'Seascape' yield was 60% of 'Everest' (15 t·ha⁻¹). Fruit weight was consistently greater than 10 g in both cultivars at the cooler site, with a low proportion of unmarketable fruit without the use of pesticides.