Hands-on Horticulture and Science Education for Home-schooled Youth

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In Fall 2007, Rutgers, NJAES Master Gardeners of Gloucester County started a Junior Master Gardener program for home schooled youth. The youth range in age from 5 to 13 years. Some families are members of home school groups, while for the others this is their first time in a group session, providing not only education but also a chance for socialization. The group meets twice a month with each session lasting for 2 hours. The curriculum being used was developed by Texas A&M University. The curriculum consists of projects that encourage recycling and hands-on activities. Initial reaction has been positive. Future evaluation will be done to determine success. This program has prompted interest in an after school program in conjunction with the county library system.

Effect of Prechilling on Stand Establishment of Purpletop (*Tridens flavus*) and Big Bluestem (*Andropogon gerardii*)

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Purpletop [*Tridens flavus* (L.) Hitchc.] and big bluestem (*Andropogon gerardii* Vitman) are warm-season perennial grasses incorporated into seeding mixes used for ecological restoration of degraded sites. The single-seeded grass fruit, the caryopsis, may exhibit low seed vigor and subsequent reduced stand establishment. Thus, improvement of stand establishment would benefit ecological restoration. Purpletop or big bluestem caryopses were prechilled (14 days at 5 ºC in 0.2% KNO_3 for purpletop and 7 days at 5 ºC in distilled water for big bluestem) and blotted dry prior to incorporation into a warm-season grass seed mix. When corrected for seed purity and application area, seeding mix rates were 0.23 to 1.91 g big bluestem/m^2 and 0.13 to 0.95 g purpletop/m^2. Seed mixes were sowed into moistened proprietary peat-lite substrate spread evenly over an area of 0.064 m^2 within a greenhouse. The number of seedlings of both control and prechilled big bluestem caryopses increased linearly with increasing seeding rates. The number of seedlings for prechilled purpletop caryopses increased linearly with increasing seeding rate but there was no linear response for control caryopses. Compared to control caryopses, crop yield was similar or greater for prechilled purpletop at equivalent seeding rates while crop yield for control or prechilled big bluestem was similar at equivalent seeding rates. In conclusion, there was no benefit of incorporating prechilled big bluestem caryopses into a warm-season grass mix but early stand establishment of purpletop was enhanced by incorporation of prechilled caryopses.

Performance of Short-day Strawberry Cultivars Grown in a Perennial Matted Row System in Maine

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A variety trail was established in Spring 2006 at Highmoor Farm in Monmouth, ME. Twenty-four named varieties and numbered selections were planted and established as matted rows on narrow raised beds with three replications. Plots were 20 ft long and 24 inches wide with a single trickle irrigation line running beneath the beds. Flowers were removed in the planting year. Yield and fruit quality data were collected in 2007 and 2008. Top performing varieties in terms of yield per plot included 'Sable', 'Mesabi', 'Cavendish', 'Mira', and 'Brunswick'. 'Itasca' performed very well in the first year of harvest, but yielded very poorly in the second. Alternatively, 'Wendy' yielded very well in the second season, but had moderate yields during the first season. 'Cabot' produced the largest fruit of any variety in the trial, followed by 'Clancy' and 'Ovation'. Flooding of the planting in 2006 appeared to weaken some of the varieties, and may have led to a red stele infection. Those most notably affected were 'L'Amour' and 'St. Laurent'.

Preliminary Results of a Low-maintenance Turfgrass Trial at the EARTH Center

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There is an increasing demand for low-maintenance turfgrass varieties to reduce fertilizer and pesticide use, protect the environment, and save time and money. The Rutgers Turfgrass Center continues to evaluate new and existing turfgrass varieties for low maintenance lawns. In Fall 2007, a trial was set up to examine some of the suggested low maintenance turfgrass varieties at the EARTH Center facility of Rutgers Cooperative Extension of Middlesex County, NJ. A total of 11 treatments were replicated four times in a randomized complete-block design. A standard premium sun and shade seed mix was selected as a control for the trial. Germination and growth rates were recorded. From 2007 through the 2008 growing season, all the plots were evaluated for weed density, color, and percent coverage. Minimal amounts of fertilizer and water have been applied since seedling establishment in 2007. Preliminary results show fescues performing very well but additional data will be collected to determine the relative success of each variety in a low-input, low-maintenance environment. The evaluation parameters are compared independently of each other and the compilation of this information will be invaluable to consumers, commercial landscapers, and superintendents interested in designing a low-maintenance landscape. Initial results indicate that select turf-type tall fescues were quick to establish and demonstrated outstanding establishment and performance under low maintenance conditions.

Shade Effects on Chlorophyll Content and Nutrient Content of Cranberry Vines Exhibiting Yellow Vine Symptoms

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Yellow vine (YV) symptoms on cranberry (*Vaccinium macrocarpon* Ait.) plants appear as yellowing along leaf margins with areas along leaf veins remaining green. It has been reported anecdotally that shaded areas on cranberry bogs tend to recover from YV symptoms quicker than unshaded areas. The objective of this project was to evaluate the effect of shading on the chlorophyll content and nutrient content of cranberry vines exhibiting YV symptoms. Shade structures were installed on a bog over both yellow and green vines. Vine clippings were collected from under all structures and from unshaded green and yellow patches. Chlorophyll content and nutrient content analysis were done on all samples. It appears that shading may positively affect chlorophyll concentrations of vines exhibiting YV symptoms, but may not have any effect on nutrient concentrations.

In Vitro Regeneration of *Rudbeckia hirta* L. 'Plainview Farm' from Leaf Tissue

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Rudbeckia hirta L. 'Plainview Farm', a new multiple-layered ray flowered cultivar, shows potential for potted plant production. After several years of seed germination, this specific morphological trait was still unstable from generation to generation. To maintain its unique features, new leaves were disinfested using 10% ultra bleach as explants. Leaf sections (0.25 cm^2) were cultured on MS medium supplemented with either BA (0.5, 1.0, and 2.0 $mg \cdot L^{-1}$), KT (2.5, 5, and 10 $mg \cdot L^{-1}$), or

ZT (0.5, 1.0, and 2.0 mg·L^{-1}) to induce the callus and microshoots at 27.2 ±1.85 °C and 16-hour photoperiod. After cultivation for 33 days, all treatments significantly induced callus, and the callus sizes were 1.5- to 2.4-fold bigger than those with no cytokinin. KT (2.5 mg·L^{-1}) was the better cytokinin concentration for callus induction and microshoot formation. A total of four microshoots per explant could be produced from that KT concentration. All induced microshoots were cultured on MS medium at its one-quarter strength containing either IBA or NAA (0.5, 1.5, and 3.0 mg·L^{-1}). No significant rooting difference was observed in comparison with the control (no auxin). The plantlets were transplanted, acclimated in a mist system, and grown in a greenhouse. A total of 96.4% of the potted plants derived from tissue culture were multiple layers of ray flowers, with only 9.6% from seed germination. Therefore, in vitro regeneration of 'Plainview Farm' was a feasible way to produce the double-flowered plants.

Lijuan Han is a visiting professor from Changchun Normal University in China.

The Quest for a Double-flowered Yellow *Clivia miniata* at Longwood Gardens

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In the mid 1970s, Longwood Gardens began a breeding program to develop improved forms of yellow-flowered *Clivia miniata*. At this time, yellow-flowered forms of *Clivia* were quite rare, and very desirable. Initial breeding crossed *Clivia miniata* var. *flava*, which has small yellow flowers with an orange-flowered variety, which has exceptionally large flowers. The resulting F1 hybrids were all orange-flowered, suggesting the yellow-flower phenotype was recessive to the orange phenotype. Therefore, seedlings of the F1 generation were intercrossed and some were also backcrossed to the yellow parent. Many yellow-flowered forms arose from both the F2 and backcross populations. These generations also had much larger flowers than *Clivia miniata* var. *flava*, but they were floppy and plant habits were not significantly better than the original yellow-flowered parent. At this time, another yellow-flowered variety (Sir John Thouron) with a very upright formal habit with flowers held well above the foliage was crossed with the best yellow seedlings from the F2 and backcross populations. One orange and two yellow-flowered seedlings with unusual petal mutations emerged from this cross. These seedlings had "keeled" petals (inner whorl of tepals), which eventually had a semi-double or ruffled appearance. Crosses with both colors of keeled-petal-plants resulted in orange flowered seedlings, due to the recessive nature of the yellow flower trait. These seedlings also varied with regard to keeled petals, in that some were absent of keeled petals while others had much more pronounced keeling compared to the parents. There were also individuals where the "keel" had actually separated from the petal to form an extra set of petals. Seedlings were chosen from this population to create the next generation based on degree of keeling. Since *Clivia miniata* takes a minimum of 3 years to flower, there is currently 3 years worth of the seedlings with enormous potential for achieving a yellow double-flower.

Effects of Seed Treatments, Commercial Seed Inoculant, and Organic Fertilizers on Germination and Seedling Growth of Common Milkweed (*Asclepias syriaca*) and Purple Coneflower (*Echinacea purpurea*)

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Common milkweed (*Ascelpias syriaca* L.) and purple coneflower [*Echinacea purpurea* (L.) Moench] are native plants used within seed mixes for ecological restoration. F actors influencing seed germination and seedling growth were analyzed to determine the influence of soil amendments (worm castings, fertilizers), commercial seed i noculant (Mycoapply), and seed treatments (prechilling of common milkweed seed for 3 weeks in distilled water at 5 ºC or PEG-priming of purple coneflower at –0.5 MPa for 4 days at 15 ºC), or combinations thereof. Treated or non-treated seed were sowed into moistened proprietary peat-lite mix or 75:25 peat-lite mix:worm castings (% by volume) substrate and germinated in a greenhouse. After seed germination, plants were fertilized weekly with 150 ppm-N of 20N–4.4P–16.6K (Scott's Peat-Lite Special), 8N–0.44P–0.83K (McGeary Organics) or 5N–0.44P–0.83K (Maxicrop Liquid Fish). Control treatments were not fertilized. Seed treatments had the greatest effect on final germination percentage (FGP) and shoot dry weight, increasing common milkweed FGP and shoot dry weight by a factor of 25.0 and 2.1, respectively, and increasing purple coneflower shoot dry weight by a factor of 2.2. Compared to the control, commercial seed inoculant plus seed treatment increased FGP of purple coneflower whereas seed treatment or commercial seed inoculant alone did not increase FGP. Treated common milkweed seed that were planted into a peat-lite:worm castings mix had decreased FGP compared to those planted into peat-lite mix alone but peat-lite:worm castings mix had little or no effect on purple coneflower. In conclusion, we found no benefit adding organic fertilizer plus commercial seed inoculant during the first 4 weeks of s of eedling establishment and that seed treatments alone, for common milkweed and purple coneflower, or seed treatments plus commercial seed inoculant, for purple coneflower, increased FGP and/or seedling growth.

In Vivo Chlorophyll Fluorescence Analysis of Yellow Vine Syndrome in Cranberry in Massachusetts

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A complete nutrition analysis suggests that a nutrition imbalance might be associated with yellow vine development in cranberry. Additionally, the yellow vine syndrome, an interveinal chlorosis advancing from old to young leaves, often worsens in bogs with drainage problems, indicating that water stress may be another factor in the formation of yellow vine in cranberries. Our spectrometric and HPLC data suggest that photoinhibition might be one of the key factors in the development of yellow vine syndrome. Chlorophyll fluorescence analysis enables the monitoring of photosynthetic performance in plants in vivo. In this study we determined the accessible chlorophyll fluorescence parameters in order to explore the mechanisms for producing yellow vine syndrome in vivo. We found that the yellow vine leaves showed a loss of 34%±5% in the maximum quantum efficiency of PS II in vivo. The analysis also showed that the quinone pool size and total photosynthesis in the yellow vine leaves were 28%±3% and of 0.4%±0.2% of normal leaves in vivo, respectively. These parameters of PSII function are dramatically smaller than those in the normal leaves, revealing the numbers of functional PSII centers in the yellow vine leaves may be far less than in the normal leaves. As PSII is the main target of photoinhibition, the chlorophyll fluorescence data strongly support a crucial role of photoinhibition in producing yellow vine syndrome in vivo. Supported by funding from USDA CSREES and UMass Dartmouth Chancellor's Research Fund.