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J.B. Edmond Undergraduate Student Paper Competition

Amending Pine Bark Supplies with *WholeTree* and Clean Chip Residual

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This study evaluated the growth of five container-grown crops in nine different substrates with varying ratios of Pine Bark (PB), Clean Chip Residual (CCR) and *WholeTree* substrate (WT) in each. Treatments consisted of 100% each of PB, WT, and CCR, and 75:25 PB:CCR and PB:WT, 50:50 PB:CCR and PB:WT, and 25:75 PB:CCR and PB:WT. CCR and WT used in this study were processed through a swinging hammer mill to pass through a 0.95 cm (3/8 inch) screen. pH and electrical conductivity (EC) levels were measured using the pour through method at 7, 15, 30, 60, and 90 days after transplanting (DAT). At 30 DAT, pH of 100% PB (5.68) climbed with increasing levels of WT to 6.57 in 100% WT. Increasing volumes of CCR at 60 DAT exhibited the same trend with pH climbing from 6.26 (100% PB) to 6.59 (100% CCR). Addition of CCR and WT tended to raise pH at all testing dates, although levels did not exceed the recommended range, possibly indicating that lime may not be needed with higher levels of CCR and WT. EC levels were high at 7 DAT, but began to stabilize around 30 DAT, although 75:25 PB:CCR tended to maintain the highest levels throughout the study (1.60 dS/m at 7 DAT to 0.72 dS/m at 60 DAT). Growth indices [(height + width1 + width2)/3] (cm) were measured at 90 DAT. There were no statistical differences in growth indices of azalea in any substrate. For spiraea and ligustrum, all treatments had growth indices that were either statistically the same or larger than 100% PB. Tea olive, however, tended to grow better in substrates with 50% PB or higher, as the 25:75 PB:CCR treatment was the only treatment to have growth indices statistically smaller than those of the 100% PB treatment. Overall, this study demonstrated that nursery producers could amend their PB supplies with up to 75% WT or CCR with limited to no impact on crop growth.

Can Honey Be Used as an Auxin Substitute for Rooting Cuttings?

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Synthetic auxins such as IBA and NAA are commonly applied to promote adventitious rooting in vegetative propagation protocols. However, health hazards are associated with their use including skin, eye and lung irritation, and mutagenesis with chronic exposure. With a growing interest in the use of organic, sustainable, and green products, the identification of a naturally-derived substitute for synthetic auxins is desirable. Honey has growth promoting and nutritional components, and has been implicated as possessing root promoting activities. The objectives of this study were to evaluate the effects of honey on adventitious rooting in chrysanthemum and to determine if honey can act as an alternative to synthetic auxins. The basal 1.5 cm of 'White Blush' Chrysanthemum cuttings were given a quick dip in either honey (100%, 50%, 25%, or 3%), 1500 ppm KIBA, or water. Percentage rooting, root number, root length, and shoot height were destructively assessed at 1 and 2 weeks; root and shoot dry weights were taken at 2 weeks. Percent rooting was rapid with >80% rooting obtained in all treatments by 1 week except for the 100% honey treatment which had a significantly lower rooting percentage, i.e., 60%. At week 2, all treatments had 100% rooting; no statistical differences in rooting percentage, number or weight were observed between KIBA, water, or honey treatments suggesting that KIBA may not be necessary for rooting in this species. However, differences in shoot dry weight were observed. All honey treatments produced plants with greater shoot dry weights and higher shoot:root ratios, indicating that honey promoted shoot and leaf growth.

Interesting Edibles: Designing an Edible Ornamental Garden for the Cliffs Botanical Garden

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Clemson University horticulture faculty and students have been working with the Cliffs Communities, a development company with private residential golf course communities in the Carolinas, to design a botanical garden for the Cliffs at Mountain Park in Travelers Rest, SC. The garden will be open to the public as a place of recreation and education for the surrounding community. Following a design methodology including research, analysis, preliminary, and final design development, a class of 10 students collaborated to research information pertaining to existing potage gardens, site analysis, photo analysis, program development, sustainable practices, and base mapping. Students then worked individually to design selected theme gardens and develop master plans. The master plans, including plant lists, pricing, quantities, planting details, and elevation drawings were presented to a board of Cliffs Community employees. The focus of this presentation will be an "Edible Ornamental Garden" which will showcase plants whose fruits, leaves, or roots are edible. Sustainable concepts have been incorporated such as native plant usage, companion planting, crop rotations, green roofs, pervious paving, and recycling material from development construction. The "Edible Ornamental Garden" has been subdivided into four different areas featuring 1) "Edibles Gone Wild," 2)"The South Carolina Garden," 3)"The Chef's Garden," and 4)"The Beverage Garden." Each area will emphasize plants with showy blooms, delicious fruits, attractive foliage, and interesting forms along with interpretative signage. The Edible Ornamental Garden will reinforce the "from farm to table" connection and educate the public on the benefits of locally grown produce.

Norman F. Childers MS Graduate Student Paper Competition

Changes in Edible Quality and Aroma Profile of 'Arkin' Carambola During Ripening on the Tree

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Commercially produced 'Arkin' carambola was harvested at five ripeness stages (1/4 yellow, 1/2 yellow, 3/4 yellow, 1/4 orange, and 1/2

orange). The following day fruit were analyzed for firmness and prepared for analysis of composition and aroma profile. Firmness was measured as the maximum force recorded as an 8-mm-diameter convex probe was extended to 7-mm depth on a 10-mm-thick equatorial slice of fruit tissue. Firmness ranged from 30.5 (1/4 yellow fruit) to 14.0 N (1/2 orange fruit), decreasing during ripening on the tree. Soluble solids content increased as fruit ripened on the tree and ranged from 5.8 (1/4 yellow) to 7.2 ºBrix (1/4 and 1/2 orange). Total titratable acidity decreased during ripening on the tree, ranging from 3.65% to 1.74% at 1/4 yellow and 1/2 orange stages respectively. Sugar-to-acid ratios, an important indicator of sweetness, increased at each progressive ripeness stage, ranging from 15.9 (1/4 yellow fruit) to 41.4 (1/2 orange fruit). Aroma analysis was performed by headspace solid phase microextraction (SPME) and gas chromatography-mass spectroscopy (GC/MS). Alkanes and ketones, which contribute to green and sweet aromas, decreased at each progressive ripeness stage. Fruit harvested at 1/4 yellow and 1/2 orange had higher total volatiles than fruit harvested at 1/2 yellow, 3/4 yellow, and 1/4 orange. Fruit harvested at 1/4 and 1/2 orange had norisoprenoid compounds which contribute to honey and sweet aromas, but also indicate carotenoid degradation. Only fruit harvested at the 1/2 orange stage had acetic acid, which contributes to pungent, stinging, and sour flavors, and ethanol, which indicates that the fruit were over-ripe.

Effect of Sowing Depth and Soil Type on Germination and Initial Growth of Three Native Wildflower Species

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Establishing native wildflower species in the landscape requires planting practices that ensure good seed germination and subsequent growth. Seeds of *Coreopsis tinctoria* Nutt. (golden tickseed), *Gaillardia pulchella* Foug. (Indian blanket), and *Rudbeckia hirta* L. (black-eyed Susan) were sown in three Alabama soil types at four sowing depths. Soil types included Marvyn loamy sand, Tallassee loamy clay, or Black Belt clay. In Aug. 2008, treatments were in a 3 soil type x 4 sowing depth factorial with three single-container replications per treatment in a completely randomized design. Twenty seeds of one species were sown in a 2.5-L (trade gal) container at one of four depths: surface (0 inch), 0.3 cm (0.125 inch), 0.6 cm (0.25 inch), and 1.3 cm (0.50 inch). Germination was recorded every other day for 2 weeks and then weekly until experiment termination on 14 Oct. 2008. For *R. hirta* and *C. tinctoria*, germination, leaf area (LA), shoot dry weight (SDW), and root dry weight (RDW) were highest when seeds were surface sown than when planted below the surface. For *G. pulchella,* germination, LA, SDW, and RDW were highest when seeds were sown below the surface, and this species had the most growth and highest germination rates of all species tested. For all species, most germination occurred within 2 weeks after sowing. Germination, LA, SDW, and RDW tended to be highest in the Tallassee soil. Although germination percentages tended to be lower than expected (21%–58%), results indicate that wildflowers can be established in various soil types throughout the state, but that care must be taken to ensure proper sowing depth for each species.

Effects of High Tunnels and Mowing on Growing Degree Unit Response and Requirement of Primocane-fruiting Blackberries

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A growing degree unit (GDU) model previously developed to predict bloom dates of floricane-fruiting blackberries was evaluated for primocane-fruiting (PF) blackberries in combination with harvest season manipulation treatments. Two experiments were conducted to determine the validity of the model and its accuracy in predicting bloom dates. One experiment used treatments of mowing canes to the ground one, two, and three times during the growing season on PF genotypes, APF-45 and APF-52. Treatments were replicated under high tunnels and ambient conditions. A second experiment used three genotypes, Prime-Jan®, Prime-Jim®, and APF-46, under high tunnels and ambient conditions with a single mowing treatment. Nodes were counted weekly and bloom dates were recorded in both experiments. GDUs were calculated based on half-hourly temperature data. Results indicate that node formation is consistent with the response model proposed for floricane-fruiting blackberries and is unaffected by high tunnels or by cane-mowing. However, total GDU at bloom and total node formation were affected by cane treatment and by genotype.

Effects of Short Interval Cyclic Flooding on Growth and Physiology of Selected Native Shrubs

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Plant species adapted to wet conditions are likely candidates for rain gardens due to their ability to withstand alternating wet and dry periods. On 16 June 2008, 30 rooted stem cuttings [0.25 L (2.25 inches)] of *Viburnum nudum* L. 'Winterthur' (possumhaw), *Ilex glabra* (L.) A. Gray. 'Shamrock' (inkberry holly), and *Itea virginica* L. 'Henry's Garnet' (sweetspire) were planted into 2.5 L (trade gal) pots and arranged in a randomized complete block design with 5 blocks in a greenhouse in Auburn, AL. Beginning on 21 July 2008, plants were flooded to substrate level for 0 (control), 3, or 7 days and then allowed to drain for one week before the same flood cycle was repeated. Photosynthesis (Ps) rates were measured for *V. nudum* 'Winterthur' and *I. virginica* 'Henry's Garnet' during flooding and draining cycles in plants flooded for 3 and 7 days. At each measurement Ps of control plants was measured. On 10 Oct. 2008, the experiment was terminated. Non-flooded plants of *I. virginica* 'Henry's Garnet' and *I. glabra* 'Shamrock' had higher growth index (GI) [(height + widest width + width perpendicular to widest width)/3] than plants flooded for 3 and 7 days. Shoot dry weight (SDW) of *I. glabra* 'Shamrock' was lower when plants were flooded for 7 days than when flooded for 0 or 3 days. SDW for *I. virginica* 'Henry's Garnet' was higher in non-flooded plants than plants flooded for 3 and 7 days. *Itea virginia* 'Henry's Garnet' root dry weight (RDW) was higher in non-flooded plants and plants flooded for 3 days, than in plants flooded for 7 days. RDW for *I. glabra* 'Shamrock' was highest in non-flooded plants, followed by plants flooded for 3 and 7 days. RDW, SDW, and GI for *V. nudum* 'Winterthur' were not different among treatments. *V. nudum* 'Winterthur' and *I. virginica* 'Henry's Garnet' Ps rates were higher during flooding than draining in both flooding treatments, and Ps rates were higher in control plants than in flooded plants. Although growth and Ps was generally lower in flooded plants than control plants, all taxa maintained visual quality and continued to grow, which suggests they would be acceptable choices for use in rain gardens.

Evaluation of Fertility in Floricane- and Primocane-fruiting Blackberry (*Rubus* L. spp.) Genotypes

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High self-fertility is important in blackberries as this crop is often grown in solid-cultivar blocks. Variation in berry set and fruit size of the recently introduced primocane-fruiting cultivars has been observed however, particularly in varied climates. Therefore, there is a need to assess overall fertility of this new type of blackberry in comparison to industry-standard floricane-fruiting cultivars. Eight genotypes, including primo- and floricane-fruiting, were tested for fertility in a field setting using floricane flowers with four pollination treatments. Treatments included open-pollinated undisturbed, emasculated selfed, emasculated and pollinated with another pollen source within fruiting type, and emasculated and pollinated with pollen of the other fruiting type. The effects of genotype and pollination treatment were significant for the number of berries set, berry weight, and visual rating of drupelet set; however, the interaction of these effects was not significant for any variables. There were no differences between cross- pollination treatments and self pollination. The open-pollinated undisturbed flowers had the highest berry set and emasculated selfed flowers had the lowest berry set. Berry set among pollination treatments ranged from 83% to 86%. Among genotypes, APF-59 and 'Navaho' had the highest set of berries (92% and 97%, respectively).